United States
Department of
Agriculture

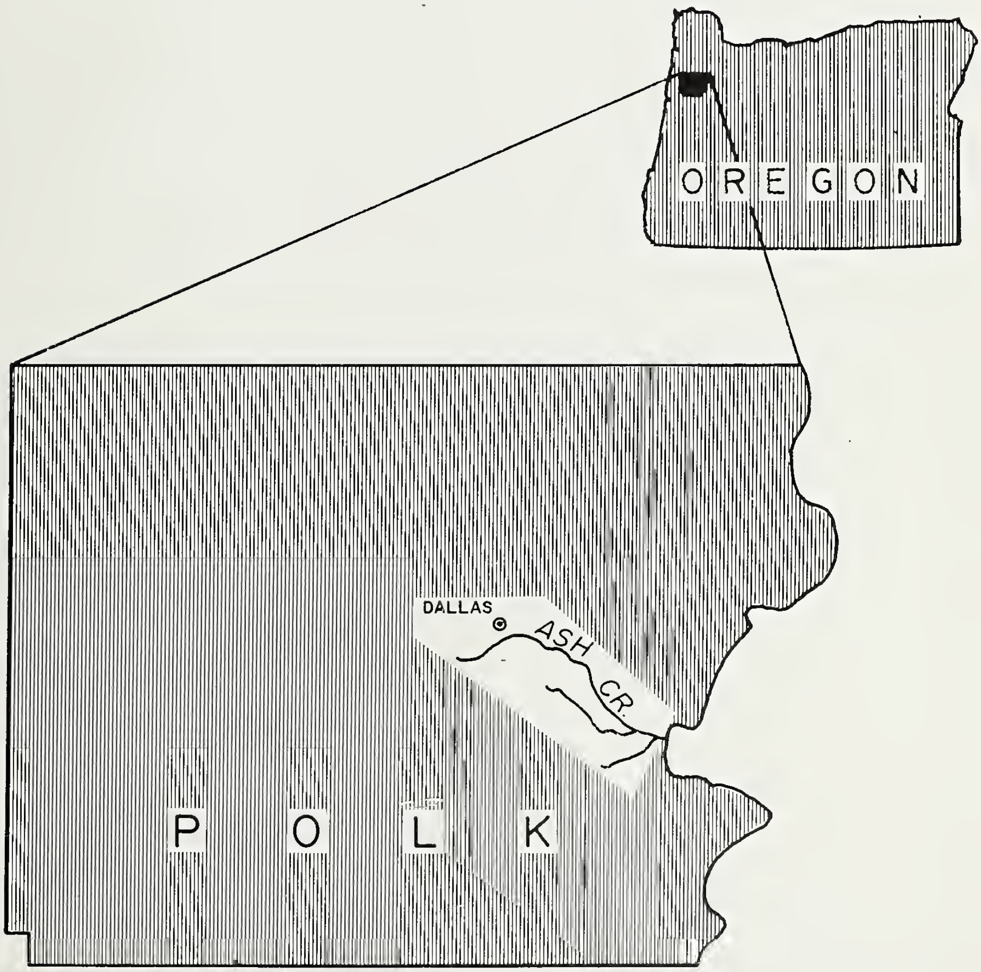
**Soil
Conservation
Service**

Portland,
Oregon

Floodplain Management Study

Ash Creek
Polk County, Oregon

in Cooperation with Polk Soil and Water Conservation District, Oregon Department of Water Resources, and the Cities of Independence, Monmouth and Dallas



FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON

USDA - SOIL CONSERVATION SERVICE

PORTLAND, OREGON

in cooperation with

POLK SOIL AND WATER CONSERVATION DISTRICT

OREGON DEPARTMENT OF WATER RESOURCES

CITY OF DALLAS

CITY OF MONMOUTH

CITY OF INDEPENDENCE

DECEMBER 1985

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ASH CREEK
POLK COUNTY
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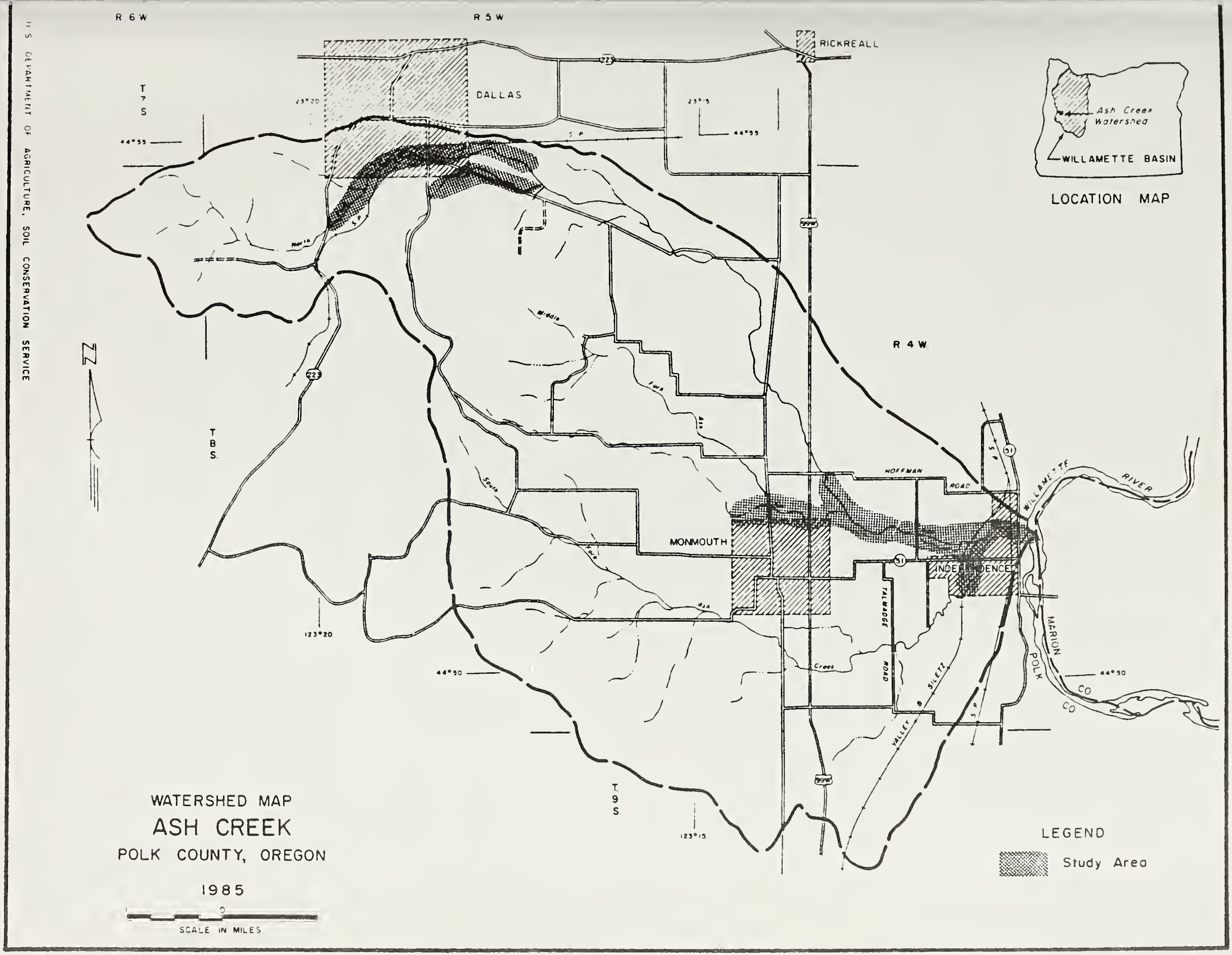
ASH CREEK FLOODPLAIN MANAGEMENT STUDY

FOREWORD

The U. S. Department of Agriculture, Soil Conservation Service, provided assistance to the cities of Dallas, Monmouth and Independence and the Polk Soil and Water Conservation District in conducting a floodplain management study of Ash Creek.

Approximately 9.2 miles of Ash Creek and its tributaries were studied to determine present flooding conditions. The hydrologic analysis used existing streamgage data from gages in the region to develop storm discharges. Hydraulic studies determined flood elevations for several frequency storms in the portions of the creek studied. The information used in the analyses are the conditions as they were in 1984-85.


WATERSHED MAP
ASH CREEK
POLK COUNTY, OREGON
1985
SCALE IN MILES
LEGEND
Study Area
LOCATION MAP
WILLAMETTE BASIN
Ash Creek Watershed
U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
R 6 W
R 5 W
R 4 W
T 7 S
T 8 S
T 9 S
DALLAS
RICKREALL
MONMOUTH
INDEPENDENCE
HOFFMAN ROAD
TALMADGE ROAD
WILLAMETTE RIVER
MARION CO
POLK CO
VALLEY & SILETZ
S P
North
Middle
South
Fork
Ash
Creek
123°20
123°15
44°55
44°50

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON

INTRODUCTION

Local Needs for the Study

Ash Creek and its tributaries flow through the cities of Dallas, Monmouth, and Independence and have caused considerable flood damage in the past. The cities are expanding their commercial, industrial, and residential areas and encroaching upon possible flood plains.

A well managed flood plain can reduce damage to property, reduce mental anguish, and save lives by controlling the location of property and/or the susceptibility to flooding. Portions of Ash Creek have been cleaned out or enlarged over the past several years.

This study is needed to obtain detailed data on flooding and potential floodplain management alternatives. It will serve as a basis for further floodplain measures and regulations.

Polk County and the three cities in the study area are involved in the Flood Insurance Program as administered by the Federal Emergency Management Agency (FEMA). The detailed data in this study will be used to establish zones and insurance rates under this program.

Study Authority

Floodplain management studies are carried out by the Soil Conservation Service (SCS) as an outgrowth of the recommendation in a report by the Task Force on Federal Flood Control Policy, House Document No. 465 (89th Congress; ordered printed August 10, 1966) especially recommended 9(c), "Regulation of Land Use."

The authority for funding floodplain management studies is Section 6 of Public Law 83-566, the Watershed Protection and Flood Prevention Act. This Act authorized USDA to cooperate with other federal, state and local agencies to make investigations and surveys of rivers and other waterways as a basis for the development of coordinated programs.

In carrying out floodplain management studies, SCS is also responsive to Executive Order No. 11988, dated May 24, 1977. Section 2(c) of this Order states: "Each agency shall take floodplain management into account when formulating or evaluating any water and land use plans. . . "

Study Purpose and Objectives

The purpose of this study was to develop detailed flood data that can be used by local community officials to reduce flood losses by improved management of the floodplain. Specific study objectives were to:

1. Prepare flood hazard maps that can be used to implement floodplain management regulations.

2. Formulate and evaluate nonstructural and/or structural management options for reducing flood damages.

3. Prepare an inventory of natural and beneficial values identifying any which are significant and should be protected.

Study Sponsors

The sponsors are the City of Dallas, City of Monmouth, City of Independence, Polk Soil and Water Conservation District and Oregon Water Resources Department. At the request of the sponsors, a Plan of Work was prepared for the study and signed in September 1983. Under the provisions of this Plan of Work, SCS did the technical studies and prepared the maps and profiles for this report. The cities of Dallas, Monmouth, and Independence provided survey information for the study equivalent to about 25% of the cost.

Ash Creek Water Control District is a legal district under State law, and its jurisdiction includes most of the stream segments in this study. It includes the North Fork and Main Ash Creek from Holman Street, Dallas to the Willamette River, and the portions of South Fork and Middle Fork studied. Maintenance and cleanout of the channel is provided by the Water Control District. Although it is not a sponsor, the District will be involved in any measures which might be undertaken along the creeks.

DESCRIPTION OF AREA

Ash Creek is located in the east central portion of Polk County, Oregon. It is part of the Willamette River subregion of the Pacific Northwest Region. Ash Creek is part of Watershed Number 1709007-010 from the Oregon Hydrologic Unit Map - Watersheds. The creek flows generally west to east from low hills west and south of Dallas to the Willamette River at Independence. There are three major tributaries: North Fork, Middle Fork, and South Fork. The North and Middle Forks join just northeast of Monmouth to form Ash Creek and the South Fork joins it in Independence. It drains 36.4 square miles and is about 8 miles long and 4½ miles wide. The highest point in the drainage is about elevation 900 feet (msl), and the lowest is at 130 feet, where Ash Creek meets the Willamette River.

Topography in the watershed varies from flat to hilly. Eastern portions are generally flat to rolling while hilly portions are confined to the western part of the watershed. The study areas are within the eastern, flatter portion of the watershed.

Ash Creek FPMS covers the main Ash Creek and portions of the North, Middle, and South Forks. There are 2.7 miles of Ash Creek between the junction of the North and Middle Forks and the Willamette River. This flows through Monmouth and Independence. About one-half mile of the South Fork is included between the Mill Dam and Ash Creek in Independence. The Middle Fork is included within Monmouth from Riddell Road downstream to the junction of the North and Middle forks. Also included is about 0.2 miles of a tributary just west of Route 99, and 0.4 miles of a tributary west of Riddell Road. A total of 1.8 miles of Middle Fork and tributaries are in the study. A short portion, 0.5 miles, of North Fork in Monmouth between Hoffman Road and Ash Creek junction is studied. About 2.9 miles of North Fork in Dallas are included between Kings Valley Road and a tributary junction below Godsey Road. A tributary of North Fork in Dallas is included between North Fork and Holman Road, approximately 0.8 miles. The entire study covers about 9.2 miles of the Creeks. The portions of the Creek studied are either in urban areas or within urban growth boundaries of the respective cities.

DESCRIPTION OF SOILS

The soils discussed for the Ash Creek Watershed were determined using the general soils map and map unit descriptions found in the Polk County Soil Survey Report. This information will provide a broad perspective of the soils and landscapes in the watershed area. For more detailed planning purposes, the detailed soil maps should be used.

Four general soil maps units make up most of the land area within the Ash Creek Watershed Area. The following is a list of those soil groups and the approximate percent of the watershed they comprise:

Dayton - Amity - Concord	=	18%
Woodburn - Willamette	=	27%
Helmick - Steiwer - Hazelair	=	17%
Bellpine - Suver - Rickreall	=	20%
Other miscellaneous soil groups	=	18%

These general soil maps units can be located using the general soil map found in the Polk County Soil Survey Report.

The Dayton - Amity - Concord map unit consists of somewhat poorly drained and poorly drained silt loams that formed in older mixed alluvium located on broad terraces of the Willamette Valley. The terrace on which these soils are found in the watershed area runs north and south between Monmouth and Independence.

This map unit is about 55 percent Dayton soils, 20 percent Amity soils, 10 percent Concord soils, and 15 percent soils of minor extent such as the Holcomb, Coburg, and Woodburn soils.

Soils of this map unit are used mainly for cereal grain, grass seed, hay, and pasture. During the winter, they have a seasonal high water table, and water ponds on the surface of the nearly level soils in periods of high precipitation. These soils have major limitations for community development including wetness due to a seasonal high water table in winter and spring and high shrink-swell on the Dayton and Concord soils.

The Woodburn - Willamette map unit consists of moderately well drained and well drained silt loams that formed in older mixed alluvium located on terraces of the Willamette Valley. This soil group is found on the rather expansive terrace on which the city of Monmouth is located.

This map unit is about 60 percent Woodburn soils, 15 percent Willamette soils, and 25 percent soils of minor extent such as the Amity, Holcomb, Helvetia, Malabon, and Santiam soils.

Soils of this map unit are used mainly for cereal grain, grass seed, orchards, hay, and pasture. These soils are well suited to most community development. The major limitations are the hazard of erosion and wetness due to a high water table in winter on most of the soils.

The Helmick - Steiwer - Hazelair map unit consists of deep and moderately deep, well drained to somewhat poorly drained silt loams. They formed in colluvium weathered from sedimentary bedrock and are located on low foothills adjacent to the Willamette Valley. Within the watershed area, these foothill soils are found west of Monmouth and extending south.

This map unit is about 40 percent Helmick soils, 20 percent Steiwer soils, 15 percent Hazelair soils, and 25 percent soils of minor extent such as the Chehulpum, Willakenzie, Bellpine, Salkum, and Suver soils.

Soils in this map unit are used principally for cereal grain, hay, and pasture. Slope is a major limitation for the use of equipment in some areas. Drainage is needed on the Helmick and Hazelair soils due to the high water table. Most of these soils have major limitations for homesite development because of the high water tables and shrink-swell potentials due to clayey subsoils. Other limitations are the steep slopes, hazard of erosion, and shallowness to bedrock of some of the soils.

The Bellpine - Suver - Rickreall map unit consists of moderately deep, deep, and shallow, well drained to somewhat poorly drained silty clay loams. They formed in colluvium weathered from sedimentary rock and are located on the low, rolling foothills that border the Willamette Valley. Within the watershed area, these soils are found in the foothills south of Dallas.

This map unit is about 50 percent Bellpine soils, 15 percent Suver soils, 10 percent Rickreall soils, and 25 percent soils of minor extent such as the Hazelair, Helmick, Dupee, Steiwer, and Willakenzie soils.

These soils are used for cereal grain, grass seed, hay, and pasture. Slope is a major limitation for the use of equipment in some areas. Drainage is needed on the Sulver soils because of a high water table. A droughty soil condition also exists in the Rickreall soil due to its shallow depth to bedrock. Some areas of this map unit have been used for homesite development, although major limitations exist which must be overcome. These limitations include steep slopes, hazard of erosion, a high water table in the Suver soil, and a shallow depth to bedrock in the Rickreall soil.

Other soil groups in Ash Creek Watershed consist largely of soils in recent alluvium and subject to periodic flooding. These occur adjacent to streams and their tributaries in the area. Soil types vary from well drained to poorly drained and are widely used for cropland.

The areas of floodplain shown on maps in this report are within Urban Growth Boundaries, as established by each city and the county planning commission. This designation withdraws the areas from consideration as "prime farmland." Prime farmland soils which occur within the Ash Creek Watershed include Amity, Bellpine, Briedwell, Chehalis, Cloquato, McAlpin, Newberg, Salkum, Steiwer, Willamette, and Woodburn

soils where slopes are less than 8 percent. Much of the area away from the stream borders are in these groups. The land represented by these soil map units within the watershed should be preserved as farmland where the soils occur in economical size farm units. The detailed soil maps should be used for more detailed planning and prime farmland soil determination.

Hydrologic soil groups are used to estimate runoff from rainfall. Soil properties are considered that influence the minimum rate of infiltration obtained for a bare soil after prolonged wetting.

The soils are classified into four groups--A, B, C, and D--with Group A having the lowest runoff potential and Group D having the highest runoff potential. The hydrologic group classification of the soils in the Ash Creek Watershed is estimated as:

10% =	Hydrologic	Soil	Group	B
38% =	"	"	"	C
52% =	"	"	"	D

NATURAL AND BENEFICIAL VALUES

The natural and beneficial floodplain values in the Ash Creek FPMS have been altered and modified considerably in the lower portion, which flows through the Cities of Independence and Monmouth. The upper portion is in farmland and suburban development and will continue to be developed. Natural values are preserved in some portions of the riparian zone, while some vegetation has been altered with residential and urban development.

The upper portions still retain much of the natural and beneficial values with some encroachment upon the creek. Continuing development in this portion may reduce the riparian zone in the future.

There are restoration opportunities in the lower portion, the residential and commercial area. A greenway development could be possible if enough interest is generated by the community.

Pollution does not appear to be a problem in the upper portion of the FPMS with the stream usually running clean and clear. The stream has several sources of pollution in the north fork due to commercial and industrial development.

Predominant farmland soils which occur within the Ash Creek Watershed are Concord, Cove, and Woodburn series, where slopes are less than five percent. These soil map units occur on bottomland terraces and are good agricultural soils when not subject to flood. This land should be preserved in farmland where the soils occur in economical size farm units.

Streamflows provide water for plants and animal life in an intermittent fashion except for periods of extreme drought. In spite of development in the lower portion of the FPMS, there are opportunities for fishing and sightseeing.

The riparian vegetation where not disturbed, include alder, ash, willows, maple, oaks, Reed canary grass, cattails, and numerous other species of aquatic vegetation.

Mammalian wildlife species in the watershed include raccoon, skunk, oppossum, gray squirrel, and many kinds of rodents. Avian species include pheasant, California quail, mourning dove, hawks, owls, and numerous species of small birds. There are no threatened and endangered species of animal or plant life in the FPMS.

FLOOD CONDITIONS

Ash Creek has experienced varying degrees of flooding from several storms in the past thirty years. Damaging floods are usually winter storms associated with a frontal activity, which brings heavy rain on already wet soil. Major storms occurred in the area in December, 1955; December, 1964; January, 1965; January, 1972; and January 1974. Flooding occurs at some points in Ash Creek annually. The larger storms of December, 1964, and January, 1972, caused extensive flooding in the valley with much agricultural land and several homes damaged.

A 100-year or one percent chance flood would flood about 380 acres in the areas studied, including 55 acres of channel. Channel velocities for this storm are between 1.0 and 7.0 feet per second with a median velocity of about 3.5 feet per second. The depth of the flow ranges between 5 feet in the upper tributaries to 26 feet near the Willamette River. Velocities and depths are discussed further in Appendix E.

Flooding, as indicated in this report, reflects the conditions of the channel in 1984-85. Channels in Independence and Monmouth generally had heavy growth of blackberries and other brush on the channel banks but did not show much debris in the stream. Within Dallas, the channel between Godsey Road and Monmouth-Cutoff Road had been newly enlarged and had little brush on the channel banks. Downstream of Godsey Road and upstream of Monmouth Road streambanks had moderate to heavy brush. The tributary to North Fork studied in Dallas had recently been cleaned of brush in the lower segment along Monmouth Cutoff Highway and enlarged between Monmouth Cutoff Highway and Godsey Road with open channel and berms along the banks. Changes to these conditions, either to heavier brush or cleared of brush, could change the flooding situation along the streams. Depth and extent of flooding would be effected by changes in streambank conditions more in storms smaller than the 100-year storm; however, this storm would also be effected. Effects of reducing the brush and debris on the channel banks is discussed in the Management Alternatives section of this report.

Bridges and narrow sections of the creek can become obstructions and/or collect debris which will temporarily raise water levels upstream of the obstruction. The potential for debris dam formation and its effects were not addressed in this study. The possibility of debris accumulation should be considered in locating new buildings. A regular channel maintenance program would reduce the chances for debris problems.

Five of the twenty bridges in this study are subject to overtopping by the 100-year flood. These are bridges at Gun Club Road and Riddell Road, Monmouth; and Uglow Street, Main Street and Kings Valley Highway, Dallas. Also subject to flooding are two private bridges to homes along Monmouth Cutoff Highway. Flooding over roads is generally shallow except at Gun Club Road which would have nearly five feet of water depth over the road.

Much of the area flooded is in cropland, parks or undeveloped land. There are over 40 buildings in or near the floodplain. No estimate has been made of the potential flood damage to buildings or bridges.

Flood levels in the lower 1.8 miles of Ash Creek are affected by the high water surface elevations on the Willamette River. This includes the area from Gun Club Road downstream. Near the mouth of Ash Creek, the Willamette would raise the flood elevation by 6 feet for the 100-year storm. Differences at Gun Club Road are negligible. It is assumed that the Willamette River would experience a 100-year flood within the same storm period as does Ash Creek, if not concurrently. Profiles and maps in this report indicate flood levels with the Willamette also at flood stage. Most of the area within this backwater flood zone is in an entrenched valley with few developed properties.

Little change in land use within the watershed is expected in the future. No large changes in runoff conditions are expected. Periodic maintenance and cleanout of the channel could change peak flows some but it would not be significant.

ALTERNATIVES FOR FLOODPLAIN MANAGEMENT

Proper management of the floodplain can minimize flood damage losses in most flood hazard areas. Several management alternatives are available that could be used by local governments and individual landowners to improve management of the Ash Creek floodplain. This section discusses those alternatives on a conceptual basis, and summarizes the potential for reducing flood damages in the Ash Creek flood hazard area.

Existing Measures

Existing floodplain management measures include enrollment in the National Flood Insurance Program (NFIP) and individual efforts by a few landowners at building floodwalls and periodic cleanout of channel segments by the Ash Creek Water Control District. The NFIP provides for regulation of development within the 100-year floodplain which includes: prohibiting development within the floodway that would cause any rise of the flood level, maintaining floor levels of new residential structures above the base flood level (within the 100-year floodplain but outside the floodway), anchoring new mobile homes to eliminate flotation, and other controls of development. Federal requirements are considered minimal; more stringent regulations may be enforced locally. The local jurisdiction, as a participant, is the regulatory body. Flood insurance is required for any federally backed loans on structures within the 100-year floodplain. In order to establish sound building codes and management regulations, the hydraulic characteristics of the flood hazard area should be known. This study provides the hydraulic information for Ash Creek. Enrollment in the Regular Flood Insurance Program makes it possible for floodplain residents to be partially reimbursed for flood losses sustained. Channel cleanout helps to maintain the capacity of the channel and protects properties from moderate storms. A scheduled periodic maintenance would keep the channel operating efficiently. Present trends in floodplain use and development would maintain cropland, pasture and brush on most of the land with encroachment of residential and commercial development of a few areas.

Critical Area Treatment

Critical area treatment consists of applying conservation land treatment practices to bare or poorly-vegetated areas to reduce runoff, erosion, and sedimentation of stream channels. Proper vegetation reduces runoff and erosion several ways. Rainfall penetrates open spaces around roots, being absorbed by the plants and stored in a humus layer formed by decaying organic material. Vegetation protects the soil from the impact of raindrops while the root system binds the soil together, reducing erosion and sediment.

Streambank erosion is occurring at several points along Ash Creek. Channel undercutting of the bank, removal of protective cover and encroachment upon the channel are causes of this erosion. There are several reaches which have been identified as problem areas.

With critical area treatment applied, the average runoff would be reduced a small amount. It was concluded that critical area treatment, by itself, would have a low potential for reducing flood damages in the Ash Creek flood hazard area. However, critical area treatment would reduce erosion and sediment. This would reduce the buildup of sediment bars in the streams and have a beneficial effect on water quality.

Nonstructural Measures

Nonstructual measures are flood-protection techniques, normally applied to individual buildings, that differ from the conventional flood-protection methods such as dams, dikes, and channel work generally used to protect groups of buildings. Nonstructural measures include the following: (1) acquisition, (2) relocation, (3) floodproofing, (4) flood warning, (5) flood insurance, and (6) channel maintenance. There are, at least, 8 commercial establishments and 20 residences, either flooded or surrounded by floodwater. Following is an assessment of the potential to protect these buildings, using nonstructural measures:

1. Acquisition. Acquisition would be recommended for properties in high-hazard zones. The high-hazard zone is the area nearest the creek where high-flood velocity and deep floodwater creates a serious danger to the lives of residents. Because of the risk to loss of life associated with these buildings, they should be purchased, removed from the floodplain, and the land used for other purposes. Federal funds are available for this type of situation through the FEMA "1362" program (Section 1362 of P.L. 90-448). However, the rules are limited to: 1) property particularly subject to flood damage, b) structure(s) covered by flood insurance, and c) structure(s) having incurred significant flood damage or repair of damage is prohibited by a local ordinance. This program calls for removal or demolition of the structure by the local community. The local governmental entity would receive title of the property with the understanding that future use would be limited to open space. Funding is limited.

   There may be high hazard areas, out of the floodway, that are currently undeveloped, but susceptible to development pressure. In such cases, acquisition is not the only remedy. A restrictive easement, which would allow the property owner to maintain the title, but restrict use in the hazardous area, may be a viable alternative. Acquisition may be an alternative on a few properties; however, it appears to have a low to moderate potential for implementation.

2. Relocation. Relocation is limited to a few buildings that could be moved a short distance to flood-free areas. Those are buildings that are near vacant lots and are structurally sound. This measure would probably cause opposition from landowners since they would be inconvenienced during the move; however, its cost is relatively low. This measure would have an average potential for implementation because of its low cost.

3. Floodproofing. Floodproofing consists of elevating existing buildings above the 100-year frequency flood by raising up the building and extending the height of the foundation and plumbing; sealing low openings and porous foundation walls; or intentionally flooding building basements to equalize hydrostatic pressures and prevent wall collapse.

   Some of the residential and commercial buildings could be elevated above the 100-year frequency flood. These buildings are located in the low-hazard flood zone. The low-hazard zone is the area away from the creek where danger to loss of life is insignificant. Most would have to be elevated a height of one to three feet. One residence in the floodplain has been elevated about 6 feet to get the living area above flood level. This may be acceptable to most landowners if proper landscaping is accomplished. Most residents would have to leave their homes for a period of two to three weeks during construction activities. Although this may be generally acceptable, elderly persons probably would not regard leaving their homes very favorably. It is judged that elevation of structures would have an average potential for implementation.

   Sealing low openings could be used to protect some of the commercial buildings and may be applicable to some residences. Sealing would consist of placing flood shields over low openings and coating masonry walls with an impermeable material. This has an average implementation potential. Intentional flooding of basements is not a potential solution in this watershed.

4. Flood Warning. A flood-warning system normally consists of National Weather Service (NWS) weather monitoring, a recording gage to monitor runoff, a flood watch, flood warning, and evacuation plan. The limiting factor in a flood-warning system for the Ash Creek flood hazard area is the warning time available. Warning time is a product of the hydrologic and hydraulic characteristics of the drainage area upstream from the flood hazard area. Maximum anticipated warning time is from 1/2 to 2 hours. Because of the limited warning time, a flood-warning system for this area has a low potential for reducing flood damages, but provides time for local residents to reach safety in very hazardous situations.

   A flood-warning system is available for the Willamette River at Salem through NWS. There are raingages, streamgages, and reservoirs upstream on the tributaries of the Willamette to monitor the storm conditions. A flood-warning time of more than 24 hours is available in which to prepare floodproofing and/or evacuation of endangered areas.

5. Flood Insurance. Polk County is participating in the Flood Insurance program. Hydraulic data developed during this current study should be sufficient for use in updating insurance rates and management regulations for the flood insurance program.

Flood insurance will reimburse owners for flood damage losses they sustain, while associated management regulations guide future improvements to avoid developments that would be flood prone. Flood insurance, with a good educational program to acquaint local landowners with its advantages, would continue to have a high potential for implementation.

6. Channel Maintenance. A scheduled, systematic program of channel and streamside maintenance could assure the maximum capacity of the natural channel during flood times. Maintenance would clean debris, dead overhanging trees, shopping carts, trash, and other items from the stream which would cause blockages to flood flows. This would not increase the water carrying capability of the channel, but would keep it from being reduced. A cooperative program involving the cities and the Ash Creek Water Control District could accomplish this program at a reasonable cost. This alternative would have a good chance of implementation.

Structural Measures

Structural measures considered for providing flood protection along Ash Creek include: (1) channel clearing and vegetative protection of streambanks; (2) channel clearing and riprap on streambanks; (3) dikes or floodwalls; and (4) enlarging the channel.

1. Channel clearing and vegetative streambank protection. This measure would clear the channel and banks of debris, brush, blackberries and trees and protect streambanks with grass cover. Clearing would reduce the chance of trees falling into the creek and debris dams developing, thus reducing the hazard of flooding. Establishment of grasses on streambanks would be difficult in many areas due to steep banks, fairly sandy soil and stream velocities. The streambanks would have to be shaped to a 2.5 or 3.0 horizontal to 1.0 vertical slope to establish, and maintain, a good grass cover. The greatest effect of streambank clearing would be protection from tree falls and debris dams. This alternative measure would have minor adverse environmental effects through loss of songbird habitat. Benefits from this are difficult to determine but could be significant in local areas.

2. Channel clearing with riprap placement on streambanks. This measure would give good protection to streambanks and reduce debris buildup. This alternative measure would have minor adverse environmental effects through loss of songbird habitat. Placement of riprap is expensive and many portions of the damage area have over 10 feet of streambank height needing protection. Cost of this work has not been determined for this study. Its probable high cost would make it a questionable project measure although significant benefits could be realized.

3. Dikes or floodwalls. Dikes or floodwalls along portions of Ash Creek would be quite effective in protecting some potentially high-valued commercial and industrial land. Land now in cropland and within the designated Urban Growth Boundary is subject to

flooding from floods greater than the 10-year storm. Some of the flood flows run across fields into drainageways going considerable distance before returning to Ash Creek. Many acres of this land could be protected from flooding by raising the existing berms by a few feet. The dikes could be developed with walkways or bike paths to make a strip or greenway. For dikes to be used to reduce the extent of the 100-year floodplain, FEMA policy states that dikes must be: a) stable (constructed and designed by a licensed engineer), b) maintain three feet of freeboard over 100-year flood level, c) covered by a legitimate maintenance agreement, and d) be subject to other FEMA standards and specifications.

4. Enlarging the channel. Flood area could be reduced by channel enlargement. This enlargement would include clearing the channel, sloping the banks and providing bank protection. This alternative measure would have minor adverse environmental effects through loss of songbird habitat. Some portions of Ash Creek have been enlarged in the past several years, providing some flood reduction. These are mostly in areas of cropland and provide protection for moderate floods, but not adequate for developed areas. Some bridges would need to be enlarged to gain full value of channel enlargement. Potential for further channel enlargement is good.

5. A combination of measures. Several combinations of the structural and non-structural measures discussed could be potential solutions to flooding problems in Ash Creek. A combination of measures could probably meet sponsors' objectives, other than flood protection, and/or be a less expensive solution. This combination could include critical area treatment, floodproofing, channel enlargement, and/or dikes. The measures together could reduce flood flows and elevations, protect residences and businesses from flood, reduce soil and streambank erosion and potentially provide added recreation areas. No combination of measures has been proposed in this Management Study, but other analyses indicate that greater benefits may be gained through groups of measures.

SPECIAL ALTERNATIVES CONSIDERED

This portion of the Ash Creek report briefly discusses some special analyses made involving specific management alternatives. These alternatives generally involve added hydraulic study and/or analysis of the study results. The analyses were done as a result of questions and comments raised by the study sponsors. No preliminary engineering designs or cost estimates were made, and no economic study of potential benefits was made.

The alternatives are discussed for each city area separately to facilitate understanding and potential action by each sponsor.

Independence Area

Specific alternatives considered in the area of the City of Independence were: (1) changes in the streambank and valley conditions; (2) alterations to Gun Club Road crossing; and (3) flood control dikes.

The channel is entrenched through much of this reach. Streambanks are thick with brush and blackberry bushes. Analyses were made to determine the effect upon flood elevations of establishing an open "greenway" in the creek valley. This greenway would be an open park during non-flood times. Because of high backwater conditions from the Willamette River, there is little effect of bank clearing from the outlet to a point upstream of Ash Street. Reductions of 0.5 to 1.5 feet could be realized above this point. This reduction would apply to all frequency storms.

Much greater reduction in flood depths would be realized in the reach below Gun Club Road, if there were high flow on Ash Creek while the Willamette River was not flooding. This would benefit some properties along this portion of the river and allow a quicker drainage of floodwaters upstream of Gun Club Road.

A floodway established to include the channel and additional flow area as needed to pass the 100-year flood would allow some filling of lands outside the floodway. A floodway would raise water levels near Gun Club Road by about one half foot if there were no change in streambank roughness. Establishing a floodway and also clearing away brush and blackberries would lower water levels to the present elevations or below.

Dikes could be built which would protect specific groups of houses and not cause significant increases in water elevation through the entire area. There are three areas in the Independence area where diking might be a proper alternative. Each of these have properties that are in the floodplain. The three areas are: (1) just upstream of the V&S railroad crossing on the south side of the creek; (2) at the Ash Brook subdivision north of the creek and east of Gun Club Road; and (3) along Rhoda Lane south of the creek near Gun Club Road. A dike three to four feet high could give protection to each of these areas from the 100-year flood. Diking in these areas could be a reasonable cost solution to local problems.

Gun Club Road has water flowing over it for all storms equal to and above a 10-year frequency. The 100-year flood would be five feet over the low point in the roadway. To eliminate flood overflow with no change to the bridge span, the road would need to be raised by eight feet. This would increase flood depth upstream of the bridge by about three feet. Added bridge openings could reduce the upstream flooding to approximately that experienced at present. This alternative has a fair implementation potential because of high cost.

A combination of the alternatives described possibly could be developed. The combination might include: (1) developing an open channel greenway; (2) diking selected areas; (3) enlarging Gun Club Road bridge; and, (4) raising the roadway on Gun Club Road. This group of measures could serve to meet objectives other than flood protection while providing flood damage reduction more economically.

Monmouth Area - Ash Creek and North Fork

Establishment of a floodway using dikes and an open greenway were also considerated for this reach of Ash Creek. Changes made in the creek downstream would have some effect upon this area either reducing or increasing the flood threat. Any works at Gun Club Road would have effect throughout much of this reach.

Major storms will overflow the channel between Hoffman Road and the sewage treatment lagoons and go into a drainageway to the north of the lagoons. This could be eliminated by increasing the height of the berms to establish dikes. Dikes should be built to withstand water pressure and erosive velocities in the Creek. They would need to be an average of three feet high and would establish one side of a floodway. Several acres of area now flooded by the overflow waters would be protected by the dikes. The areas are primarily in cropland at present, but are within the proposed Monmouth commercial/industrial zone.

A zone on the south side of the Creek between Hoffman Road and the junction with the Middle Fork could also be given flood protection by establishing dikes. Dikes generally would need to be higher than on the north side. A distance of approximately 100 feet between dikes would establish an adequate floodway. The area protected by the dike is also a designated commercial/industrial area.

The dikes and the area between could be maintained as an open greenway. Heavy brush and blackberries encroach on the channel in places and reduce the flood capacities. Clearing of this brush and planting grasses on the banks with trees and selected shrubs beside the bank would enhance the aesthetics of a greenway. Summer flows through this area are intermittent. This combination of dike and greenway park could have a good chance for implementation.

Those properties on the west side of Gun Club Road near Ash Creek are subject to flooding and would be influenced by any change to

that road. No specific studies were made of alternatives for protection; however, the problem would be reduced by eliminating flood overflow upstream. Also, the properties nearest the creek in Ash Creek Mobile Park upstream of Gun Club Road may be in danger of some flooding and/or damage from bank erosion. Studies indicate they are close to flood elevations.

Monmouth Area - Middle Fork Ash Creek

The possible development of a greenway was again considered on the Middle Fork. It would open the channel by removing debris and encroaching brush while leaving some trees. This would reduce flood depths some while providing a "strip park" area. There is a potential for developing one greenway or "strip park" from Riddell Road to the Willamette River. It could be developed with bike/jogging path and shaded areas to provide recreation open space as well as flood protection.

Alterations to eliminate flooding over the Riddell Road were considered. The 100-year flood would flood over the road by 0.3 feet but will flood over 650 feet of the road. Raising the road to eliminate this flooding would require over 2 feet of fill. Doubling of the present culvert size would lower upstream flood levels to below the present roadway. Alternatives between these two would give some lesser degree of flood protection.

Dallas Area - North Fork

Several segments of the North Fork Ash Creek below Monmouth Cutoff Highway have been cleared and enlarged in recent years, resulting in flow capacities at or near the 100-year flood. An active, regular maintenance program is necessary to keep the channel capacities at present levels. Growth of blackberries and brush on streambanks would reduce the capacity. Also, raised berms along the channel must be well maintained to continue to control flood flows.

The stream overflows to the south between the mill at Uglow Street and Monmouth Cutoff Highway. Diking of this segment was considered as an alternative. A two- to five-foot dike, or berm, would contain flows below Uglow Street; however, the bridge at Uglow Street is a constriction and would need to be enlarged and the roadway raised to keep flows in the channel.

With the flows of North Fork confined in the channel, flood flows and flooding would be reduced considerably in the tributary to North Fork, which was studied. Nearly half of the 100-year peak flow in that tributary is overflow water from North Fork. Natural flows in the tributary would have high water elevations over a foot lower than with the present flows.

The area of North Fork Ash Creek upstream of the Mill at Main Street is mainly in agricultural uses. Flooding in this area is not extensive and causes few problems, and no alternatives for controlling the flows were considered.

Previous studies have identified a possible storage site upstream of Dallas to control the flows in North Fork. It would be able to effectively control flood runoff and reduce flooding. It would be expensive to build, and the present damages with the improved channel probably could not support the construction costs. This is not considered a viable alternative at this time.

USDA PROGRAMS

There are several USDA program opportunities which could aid in evaluating and implementing the project measures discussed in the prior sections of this report. Project action is available through conservation operations, group planning special projects, resource conservation and development (RC&D), and the watershed protection (PL-566) program. Each of these programs would evaluate needs and problems more fully, determine viable solutions with costs and benefits, and determine potential federal cost sharing for implementing project measures. A strong local support is a key factor for getting federal support. Erosion and upstream flood problems in this creek coincide with the high priority objectives of the Soil Conservation Service.

The purpose of the Resource Conservation and Development (RC&D) program is to accelerate the conservation, development, and utilization of natural resources to improve the general level of economic activity, and to enhance the environment and standard of living in authorized RC&D areas. Authorized areas are locally sponsored areas designated by the Secretary of Agriculture for RC&D technical and financial assistance program funds. The Secretary of Agriculture, through authorities delegated to SCS and other USDA agencies, makes available to states, local units of government, and local nonprofit organizations, planning, design and cost share assistance necessary to operate and maintain an RC&D area. Polk County is in the Willamette RC&D project area.

The Watershed Protection and Flood Prevention Act, Public Law 83-566, Stat. 666, authorizes "the Secretary of Agriculture to cooperate with states and local agencies in the planning and carrying out of works of improvement for soil conservation and for other purposes." It provides for technical, financial, and credit assistance by the Department to local organizations representing the people living in small watersheds. It also provides for needed additional treatment and protection of federally owned lands within such watersheds. Moreover, the Act provides for a project-type approach to solving land, water, and related resource problems. It requires that full initiative and maximum responsibility for any undertaking be exercised by local people through their local organizations.

FLOODPLAIN MANAGEMENT APPENDICES

The Ash Creek Watershed map in the front of this report outlines the drainage area of the creek. It also highlights the portions of the creek studied.

The Index Map, Appendix A, shows the study area. The location and area covered by each of the five hazard maps is shown.

Appendix B contains the five flood hazard photomaps. These maps show the area inundated by the 100-year and 500-year floods. In the places where only the 100-year floodplain is indicated, the line represents both the 100-year and 500-year floodplains. This is because the two floodplains are so close together that only one line could be shown on the drawings. The location of each cross-section and the 100-year flood elevation at the section is also on the photomap. The flood elevations have been computed at each cross-section and the elevation between cross-sections has been interpolated. The floodplain maps were not field-checked by any instrument surveys.

Some variation is possible in the area flooded by a particular storm due to several conditions. Slight flooding may occur outside the mapped floodplain due to a tributary drain or other concentrated local runoff from areas adjacent to the floodplain. Debris buildup in the creek could cause locally higher flood levels where they occur. This study is not able to consider the potential effect of the debris dams. It is possible that islands may exist within the floodplain that do not show on the photomaps. Some buildings which are within the flood area may have floor levels above the flood levels. The maps are intended to show the general ground elevations. To determine the flooding potential at a specific location, a field survey would be required using the computed or interpolated flood elevations.

Water surface profiles of the portions studied have been prepared and are included as Appendix C. The 10-, 100- and 500-year flood profiles are plotted. Flood elevations between cross-sections can be determined from the profiles. The stationing and distance between sections is measured along the centerline of the creek. Stream bottom elevations at each section and bridge girder and roadway elevations are given on the profiles.

Appendix D is a tabulation of the cross section data and flood elevations which were used to develop the Flood Hazard Maps (Appendix B) and Flood Profiles (Appendix C). Investigations and Analyses (Appendix E) describe the technical studies which were done in the development of the maps and this report. This section also discusses the criteria for establishing a floodway portion of the creek.

Also included in this report are Bibliography (Appendix F) and Glossary (Appendix G).

United States
Department of
Agriculture

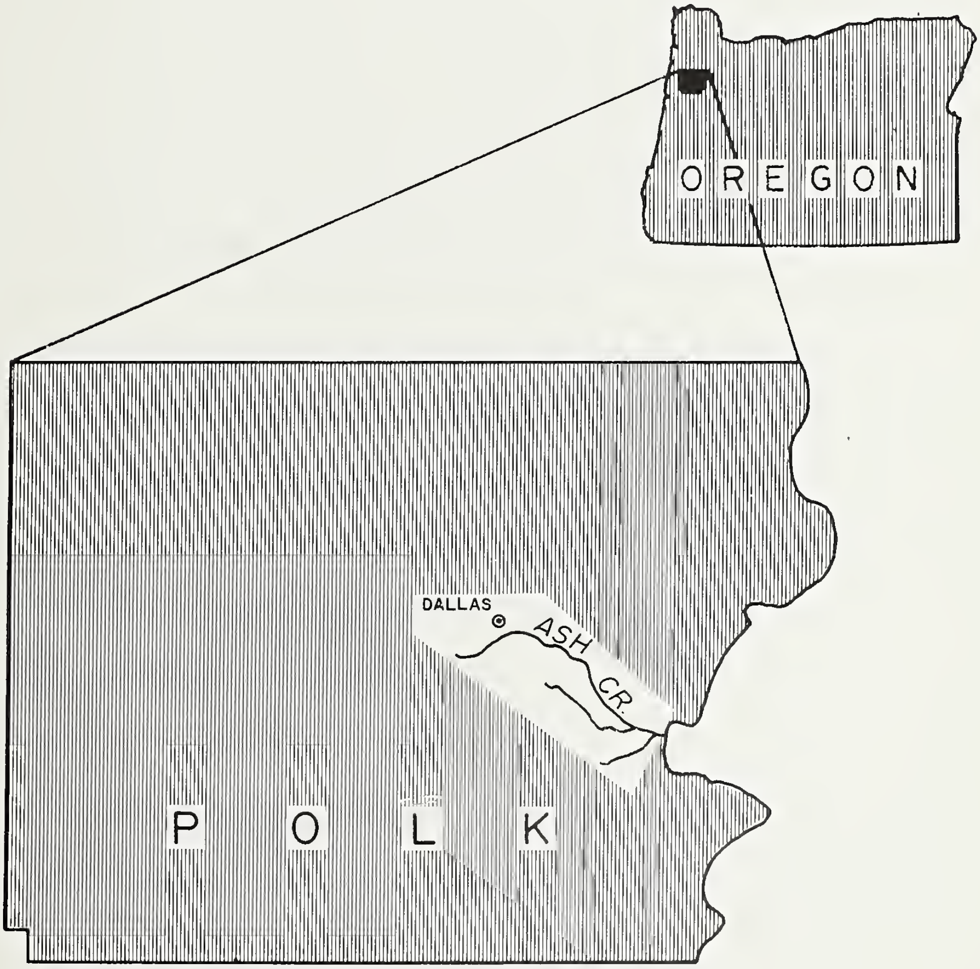
Soil Conservation Service

Portland, Oregon

Floodplain Management Study

Ash Creek
Polk County, Oregon

in Cooperation with Polk Soil and Water Conservation District, Oregon Department of Water Resources, and the Cities of Independence, Monmouth and Dallas



FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON

USDA - SOIL CONSERVATION SERVICE

PORTLAND, OREGON

in cooperation with

POLK SOIL AND WATER CONSERVATION DISTRICT

OREGON DEPARTMENT OF WATER RESOURCES

CITY OF DALLAS

CITY OF MONMOUTH

CITY OF INDEPENDENCE

DECEMBER 1985

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY
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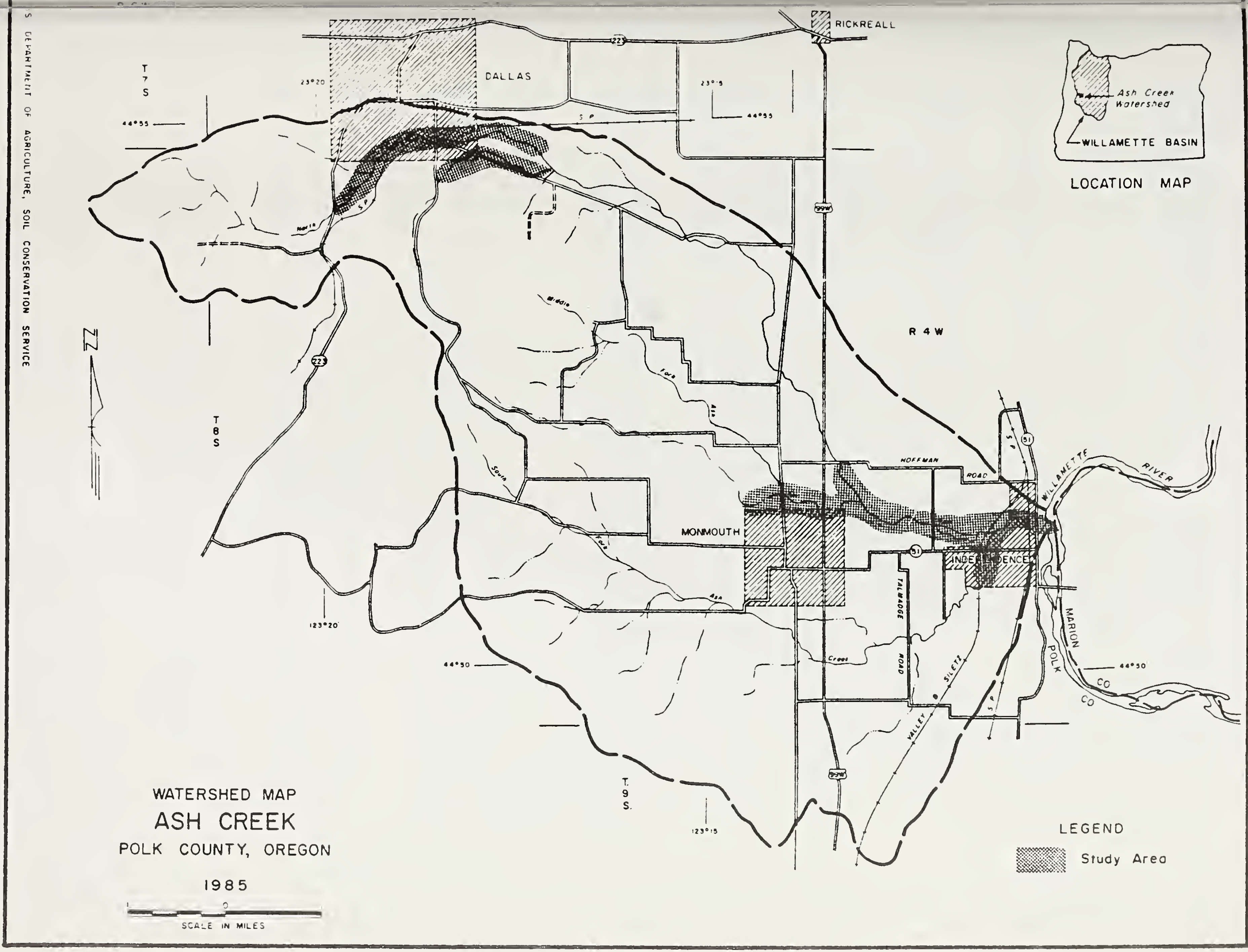
ASH CREEK FLOODPLAIN MANAGEMENT STUDY

FOREWORD

The U. S. Department of Agriculture, Soil Conservation Service, provided assistance to the cities of Dallas, Monmouth and Independence and the Polk Soil and Water Conservation District in conducting a floodplain management study of Ash Creek.

Approximately 9.2 miles of Ash Creek and its tributaries were studied to determine present flooding conditions. The hydrologic analysis used existing streamgage data from gages in the region to develop storm discharges. Hydraulic studies determined flood elevations for several frequency storms in the portions of the creek studied. The information used in the analyses are the conditions as they were in 1984-85.



US DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON

INTRODUCTION

Local Needs for the Study

Ash Creek and its tributaries flow through the cities of Dallas, Monmouth, and Independence and have caused considerable flood damage in the past. The cities are expanding their commercial, industrial, and residential areas and encroaching upon possible flood plains.

A well managed flood plain can reduce damage to property, reduce mental anguish, and save lives by controlling the location of property and/or the susceptibility to flooding. Portions of Ash Creek have been cleaned out or enlarged over the past several years.

This study is needed to obtain detailed data on flooding and potential floodplain management alternatives. It will serve as a basis for further floodplain measures and regulations.

Polk County and the three cities in the study area are involved in the Flood Insurance Program as administered by the Federal Emergency Management Agency (FEMA). The detailed data in this study will be used to establish zones and insurance rates under this program.

Study Authority

Floodplain management studies are carried out by the Soil Conservation Service (SCS) as an outgrowth of the recommendation in a report by the Task Force on Federal Flood Control Policy, House Document No. 465 (89th Congress; ordered printed August 10, 1966) especially recommended 9(c), "Regulation of Land Use."

The authority for funding floodplain management studies is Section 6 of Public Law 83-566, the Watershed Protection and Flood Prevention Act. This Act authorized USDA to cooperate with other federal, state and local agencies to make investigations and surveys of rivers and other waterways as a basis for the development of coordinated programs.

In carrying out floodplain management studies, SCS is also responsive to Executive Order No. 11988, dated May 24, 1977. Section 2(c) of this Order states: "Each agency shall take floodplain management into account when formulating or evaluating any water and land use plans. . . "

Study Purpose and Objectives

The purpose of this study was to develop detailed flood data that can be used by local community officials to reduce flood losses by improved management of the floodplain. Specific study objectives were to:

1. Prepare flood hazard maps that can be used to implement floodplain management regulations.

2. Formulate and evaluate nonstructural and/or structural management options for reducing flood damages.

3. Prepare an inventory of natural and beneficial values identifying any which are significant and should be protected.

Study Sponsors

The sponsors are the City of Dallas, City of Monmouth, City of Independence, Polk Soil and Water Conservation District and Oregon Water Resources Department. At the request of the sponsors, a Plan of Work was prepared for the study and signed in September 1983. Under the provisions of this Plan of Work, SCS did the technical studies and prepared the maps and profiles for this report. The cities of Dallas, Monmouth, and Independence provided survey information for the study equivalent to about 25% of the cost.

Ash Creek Water Control District is a legal district under State law, and its jurisdiction includes most of the stream segments in this study. It includes the North Fork and Main Ash Creek from Holman Street, Dallas to the Willamette River, and the portions of South Fork and Middle Fork studied. Maintenance and cleanout of the channel is provided by the Water Control District. Although it is not a sponsor, the District will be involved in any measures which might be undertaken along the creeks.

DESCRIPTION OF AREA

Ash Creek is located in the east central portion of Polk County, Oregon. It is part of the Willamette River subregion of the Pacific Northwest Region. Ash Creek is part of Watershed Number 1709007-010 from the Oregon Hydrologic Unit Map - Watersheds. The creek flows generally west to east from low hills west and south of Dallas to the Willamette River at Independence. There are three major tributaries: North Fork, Middle Fork, and South Fork. The North and Middle Forks join just northeast of Monmouth to form Ash Creek and the South Fork joins it in Independence. It drains 36.4 square miles and is about 8 miles long and 4½ miles wide. The highest point in the drainage is about elevation 900 feet (msl), and the lowest is at 130 feet, where Ash Creek meets the Willamette River.

Topography in the watershed varies from flat to hilly. Eastern portions are generally flat to rolling while hilly portions are confined to the western part of the watershed. The study areas are within the eastern, flatter portion of the watershed.

Ash Creek FPMS covers the main Ash Creek and portions of the North, Middle, and South Forks. There are 2.7 miles of Ash Creek between the junction of the North and Middle Forks and the Willamette River. This flows through Monmouth and Independence. About one-half mile of the South Fork is included between the Mill Dam and Ash Creek in Independence. The Middle Fork is included within Monmouth from Riddell Road downstream to the junction of the North and Middle forks. Also included is about 0.2 miles of a tributary just west of Route 99, and 0.4 miles of a tributary west of Riddell Road. A total of 1.8 miles of Middle Fork and tributaries are in the study. A short portion, 0.5 miles, of North Fork in Monmouth between Hoffman Road and Ash Creek junction is studied. About 2.9 miles of North Fork in Dallas are included between Kings Valley Road and a tributary junction below Godsey Road. A tributary of North Fork in Dallas is included between North Fork and Holman Road, approximately 0.8 miles. The entire study covers about 9.2 miles of the Creeks. The portions of the Creek studied are either in urban areas or within urban growth boundaries of the respective cities.

DESCRIPTION OF SOILS

The soils discussed for the Ash Creek Watershed were determined using the general soils map and map unit descriptions found in the Polk County Soil Survey Report. This information will provide a broad perspective of the soils and landscapes in the watershed area. For more detailed planning purposes, the detailed soil maps should be used.

Four general soil maps units make up most of the land area within the Ash Creek Watershed Area. The following is a list of those soil groups and the approximate percent of the watershed they comprise:

Dayton - Amity - Concord	=	18%
Woodburn - Willamette	=	27%
Helmick - Steiwer - Hazelair	=	17%
Bellpine - Suver - Rickreall	=	20%
Other miscellaneous soil groups	=	18%

These general soil maps units can be located using the general soil map found in the Polk County Soil Survey Report.

The Dayton - Amity - Concord map unit consists of somewhat poorly drained and poorly drained silt loams that formed in older mixed alluvium located on broad terraces of the Willamette Valley. The terrace on which these soils are found in the watershed area runs north and south between Monmouth and Independence.

This map unit is about 55 percent Dayton soils, 20 percent Amity soils, 10 percent Concord soils, and 15 percent soils of minor extent such as the Holcomb, Coburg, and Woodburn soils.

Soils of this map unit are used mainly for cereal grain, grass seed, hay, and pasture. During the winter, they have a seasonal high water table, and water ponds on the surface of the nearly level soils in periods of high precipitation. These soils have major limitations for community development including wetness due to a seasonal high water table in winter and spring and high shrink-swell on the Dayton and Concord soils.

The Woodburn - Willamette map unit consists of moderately well drained and well drained silt loams that formed in older mixed alluvium located on terraces of the Willamette Valley. This soil group is found on the rather expansive terrace on which the city of Monmouth is located.

This map unit is about 60 percent Woodburn soils, 15 percent Willamette soils, and 25 percent soils of minor extent such as the Amity, Holcomb, Helvetia, Malabon, and Santiam soils.

Soils of this map unit are used mainly for cereal grain, grass seed, orchards, hay, and pasture. These soils are well suited to most community development. The major limitations are the hazard of erosion and wetness due to a high water table in winter on most of the soils.

The Helmick - Steiwer - Hazelair map unit consists of deep and moderately deep, well drained to somewhat poorly drained silt loams. They formed in colluvium weathered from sedimentary bedrock and are located on low foothills adjacent to the Willamette Valley. Within the watershed area, these foothill soils are found west of Monmouth and extending south.

This map unit is about 40 percent Helmick soils, 20 percent Steiwer soils, 15 percent Hazelair soils, and 25 percent soils of minor extent such as the Chehulpum, Willakenzie, Bellpine, Salkum, and Suver soils.

Soils in this map unit are used principally for cereal grain, hay, and pasture. Slope is a major limitation for the use of equipment in some areas. Drainage is needed on the Helmick and Hazelair soils due to the high water table. Most of these soils have major limitations for homesite development because of the high water tables and shrink-swell potentials due to clayey subsoils. Other limitations are the steep slopes, hazard of erosion, and shallowness to bedrock of some of the soils.

The Bellpine - Suver - Rickreall map unit consists of moderately deep, deep, and shallow, well drained to somewhat poorly drained silty clay loams. They formed in colluvium weathered from sedimentary rock and are located on the low, rolling foothills that border the Willamette Valley. Within the watershed area, these soils are found in the foothills south of Dallas.

This map unit is about 50 percent Bellpine soils, 15 percent Suver soils, 10 percent Rickreall soils, and 25 percent soils of minor extent such as the Hazelair, Helmick, Dupee, Steiwer, and Willakenzie soils.

These soils are used for cereal grain, grass seed, hay, and pasture. Slope is a major limitation for the use of equipment in some areas. Drainage is needed on the Sulver soils because of a high water table. A droughty soil condition also exists in the Rickreall soil due to its shallow depth to bedrock. Some areas of this map unit have been used for homesite development, although major limitations exist which must be overcome. These limitations include steep slopes, hazard of erosion, a high water table in the Suver soil, and a shallow depth to bedrock in the Rickreall soil.

Other soil groups in Ash Creek Watershed consist largely of soils in recent alluvium and subject to periodic flooding. These occur adjacent to streams and their tributaries in the area. Soil types vary from well drained to poorly drained and are widely used for cropland.

The areas of floodplain shown on maps in this report are within Urban Growth Boundaries, as established by each city and the county planning commission. This designation withdraws the areas from consideration as "prime farmland." Prime farmland soils which occur within the Ash Creek Watershed include Amity, Bellpine, Briedwell, Chehalis, Cloquato, McAlpin, Newberg, Salkum, Steiwer, Willamette, and Woodburn

soils where slopes are less than 8 percent. Much of the area away from the stream borders are in these groups. The land represented by these soil map units within the watershed should be preserved as farmland where the soils occur in economical size farm units. The detailed soil maps should be used for more detailed planning and prime farmland soil determination.

Hydrologic soil groups are used to estimate runoff from rainfall. Soil properties are considered that influence the minimum rate of infiltration obtained for a bare soil after prolonged wetting.

The soils are classified into four groups--A, B, C, and D--with Group A having the lowest runoff potential and Group D having the highest runoff potential. The hydrologic group classification of the soils in the Ash Creek Watershed is estimated as:

10%	=	Hydrologic	Soil	Group	B
38%	=	"	"	"	C
52%	=	"	"	"	D

Much of the area flooded is in cropland, parks or undeveloped land. There are over 40 buildings in or near the floodplain. No estimate has been made of the potential flood damage to buildings or bridges.

Flood levels in the lower 1.8 miles of Ash Creek are affected by the high water surface elevations on the Willamette River. This includes the area from Gun Club Road downstream. Near the mouth of Ash Creek, the Willamette would raise the flood elevation by 6 feet for the 100-year storm. Differences at Gun Club Road are negligible. It is assumed that the Willamette River would experience a 100-year flood within the same storm period as does Ash Creek, if not concurrently. Profiles and maps in this report indicate flood levels with the Willamette also at flood stage. Most of the area within this backwater flood zone is in an entrenched valley with few developed properties.

Little change in land use within the watershed is expected in the future. No large changes in runoff conditions are expected. Periodic maintenance and cleanout of the channel could change peak flows some but it would not be significant.

ALTERNATIVES FOR FLOODPLAIN MANAGEMENT

Proper management of the floodplain can minimize flood damage losses in most flood hazard areas. Several management alternatives are available that could be used by local governments and individual landowners to improve management of the Ash Creek floodplain. This section discusses those alternatives on a conceptual basis, and summarizes the potential for reducing flood damages in the Ash Creek flood hazard area.

Existing Measures

Existing floodplain management measures include enrollment in the National Flood Insurance Program (NFIP) and individual efforts by a few landowners at building floodwalls and periodic cleanout of channel segments by the Ash Creek Water Control District. The NFIP provides for regulation of development within the 100-year floodplain which includes: prohibiting development within the floodway that would cause any rise of the flood level, maintaining floor levels of new residential structures above the base flood level (within the 100-year floodplain but outside the floodway), anchoring new mobile homes to eliminate flotation, and other controls of development. Federal requirements are considered minimal; more stringent regulations may be enforced locally. The local jurisdiction, as a participant, is the regulatory body. Flood insurance is <u>required</u> for any federally backed loans on structures within the 100-year floodplain. In order to establish sound building codes and management regulations, the hydraulic characteristics of the flood hazard area should be known. This study provides the hydraulic information for Ash Creek. Enrollment in the Regular Flood Insurance Program makes it possible for floodplain residents to be partially reimbursed for flood losses sustained. Channel cleanout helps to maintain the capacity of the channel and protects properties from moderate storms. A scheduled periodic maintenance would keep the channel operating efficiently. Present trends in floodplain use and development would maintain cropland, pasture and brush on most of the land with encroachment of residential and commercial development of a few areas.

Critical Area Treatment

Critical area treatment consists of applying conservation land treatment practices to bare or poorly-vegetated areas to reduce runoff, erosion, and sedimentation of stream channels. Proper vegetation reduces runoff and erosion several ways. Rainfall penetrates open spaces around roots, being absorbed by the plants and stored in a humus layer formed by decaying organic material. Vegetation protects the soil from the impact of raindrops while the root system binds the soil together, reducing erosion and sediment.

Streambank erosion is occurring at several points along Ash Creek. Channel undercutting of the bank, removal of protective cover and encroachment upon the channel are causes of this erosion. There are several reaches which have been identified as problem areas.

With critical area treatment applied, the average runoff would be reduced a small amount. It was concluded that critical area treatment, by itself, would have a low potential for reducing flood damages in the Ash Creek flood hazard area. However, critical area treatment would reduce erosion and sediment. This would reduce the buildup of sediment bars in the streams and have a beneficial effect on water quality.

Nonstructural Measures

Nonstructual measures are flood-protection techniques, normally applied to individual buildings, that differ from the conventional flood-protection methods such as dams, dikes, and channel work generally used to protect groups of buildings. Nonstructural measures include the following: (1) acquisition, (2) relocation, (3) floodproofing, (4) flood warning, (5) flood insurance, and (6) channel maintenance. There are, at least, 8 commercial establishments and 20 residences, either flooded or surrounded by floodwater. Following is an assessment of the potential to protect these buildings, using nonstructural measures:

1. Acquisition. Acquisition would be recommended for properties in high-hazard zones. The high-hazard zone is the area nearest the creek where high-flood velocity and deep floodwater creates a serious danger to the lives of residents. Because of the risk to loss of life associated with these buildings, they should be purchased, removed from the floodplain, and the land used for other purposes. Federal funds are available for this type of situation through the FEMA "1362" program (Section 1362 of P.L. 90-448). However, the rules are limited to: 1) property particularly subject to flood damage, b) structure(s) covered by flood insurance, and c) structure(s) having incurred significant flood damage or repair of damage is prohibited by a local ordinance. This program calls for removal or demolition of the structure by the local community. The local governmental entity would receive title of the property with the understanding that future use would be limited to open space. Funding is limited.

   There may be high hazard areas, out of the floodway, that are currently undeveloped, but susceptible to development pressure. In such cases, acquisition is not the only remedy. A restrictive easement, which would allow the property owner to maintain the title, but restrict use in the hazardous area, may be a viable alternative. Acquisition may be an alternative on a few properties; however, it appears to have a low to moderate potential for implementation.

2. Relocation. Relocation is limited to a few buildings that could be moved a short distance to flood-free areas. Those are buildings that are near vacant lots and are structurally sound. This measure would probably cause opposition from landowners since they would be inconvenienced during the move; however, its cost is relatively low. This measure would have an average potential for implementation because of its low cost.

3. Floodproofing. Floodproofing consists of elevating existing buildings above the 100-year frequency flood by raising up the building and extending the height of the foundation and plumbing; sealing low openings and porous foundation walls; or intentionally flooding building basements to equalize hydrostatic pressures and prevent wall collapse.

   Some of the residential and commercial buildings could be elevated above the 100-year frequency flood. These buildings are located in the low-hazard flood zone. The low-hazard zone is the area away from the creek where danger to loss of life is insignificant. Most would have to be elevated a height of one to three feet. One residence in the floodplain has been elevated about 6 feet to get the living area above flood level. This may be acceptable to most landowners if proper landscaping is accomplished. Most residents would have to leave their homes for a period of two to three weeks during construction activities. Although this may be generally acceptable, elderly persons probably would not regard leaving their homes very favorably. It is judged that elevation of structures would have an average potential for implementation.

   Sealing low openings could be used to protect some of the commercial buildings and may be applicable to some residences. Sealing would consist of placing flood shields over low openings and coating masonry walls with an impermeable material. This has an average implementation potential. Intentional flooding of basements is not a potential solution in this watershed.

4. Flood Warning. A flood-warning system normally consists of National Weather Service (NWS) weather monitoring, a recording gage to monitor runoff, a flood watch, flood warning, and evacuation plan. The limiting factor in a flood-warning system for the Ash Creek flood hazard area is the warning time available. Warning time is a product of the hydrologic and hydraulic characteristics of the drainage area upstream from the flood hazard area. Maximum anticipated warning time is from 1/2 to 2 hours. Because of the limited warning time, a flood-warning system for this area has a low potential for reducing flood damages, but provides time for local residents to reach safety in very hazardous situations.

   A flood-warning system is available for the Willamette River at Salem through NWS. There are raingages, streamgages, and reservoirs upstream on the tributaries of the Willamette to monitor the storm conditions. A flood-warning time of more than 24 hours is available in which to prepare floodproofing and/or evacuation of endangered areas.

5. Flood Insurance. Polk County is participating in the Flood Insurance program. Hydraulic data developed during this current study should be sufficient for use in updating insurance rates and management regulations for the flood insurance program.

Flood insurance will reimburse owners for flood damage losses they sustain, while associated management regulations guide future improvements to avoid developments that would be flood prone. Flood insurance, with a good educational program to acquaint local landowners with its advantages, would continue to have a high potential for implementation.

6. Channel Maintenance. A scheduled, systematic program of channel and streamside maintenance could assure the maximum capacity of the natural channel during flood times. Maintenance would clean debris, dead overhanging trees, shopping carts, trash, and other items from the stream which would cause blockages to flood flows. This would not increase the water carrying capability of the channel, but would keep it from being reduced. A cooperative program involving the cities and the Ash Creek Water Control District could accomplish this program at a reasonable cost. This alternative would have a good chance of implementation.

Structural Measures

Structural measures considered for providing flood protection along Ash Creek include: (1) channel clearing and vegetative protection of streambanks; (2) channel clearing and riprap on streambanks; (3) dikes or floodwalls; and (4) enlarging the channel.

1. Channel clearing and vegetative streambank protection. This measure would clear the channel and banks of debris, brush, blackberries and trees and protect streambanks with grass cover. Clearing would reduce the chance of trees falling into the creek and debris dams developing, thus reducing the hazard of flooding. Establishment of grasses on streambanks would be difficult in many areas due to steep banks, fairly sandy soil and stream velocities. The streambanks would have to be shaped to a 2.5 or 3.0 horizontal to 1.0 vertical slope to establish, and maintain, a good grass cover. The greatest effect of streambank clearing would be protection from tree falls and debris dams. This alternative measure would have minor adverse environmental effects through loss of songbird habitat. Benefits from this are difficult to determine but could be significant in local areas.

2. Channel clearing with riprap placement on streambanks. This measure would give good protection to streambanks and reduce debris buildup. This alternative measure would have minor adverse environmental effects through loss of songbird habitat. Placement of riprap is expensive and many portions of the damage area have over 10 feet of streambank height needing protection. Cost of this work has not been determined for this study. Its probable high cost would make it a questionable project measure although significant benefits could be realized.

3. Dikes or floodwalls. Dikes or floodwalls along portions of Ash Creek would be quite effective in protecting some potentially high-valued commercial and industrial land. Land now in cropland and within the designated Urban Growth Boundary is subject to

flooding from floods greater than the 10-year storm. Some of the flood flows run across fields into drainageways going considerable distance before returning to Ash Creek. Many acres of this land could be protected from flooding by raising the existing berms by a few feet. The dikes could be developed with walkways or bike paths to make a strip or greenway. For dikes to be used to reduce the extent of the 100-year floodplain, FEMA policy states that dikes must be: a) stable (constructed and designed by a licensed engineer), b) maintain three feet of freeboard over 100-year flood level, c) covered by a legitimate maintenance agreement, and d) be subject to other FEMA standards and specifications.

4. Enlarging the channel. Flood area could be reduced by channel enlargement. This enlargement would include clearing the channel, sloping the banks and providing bank protection. This alternative measure would have minor adverse environmental effects through loss of songbird habitat. Some portions of Ash Creek have been enlarged in the past several years, providing some flood reduction. These are mostly in areas of cropland and provide protection for moderate floods, but not adequate for developed areas. Some bridges would need to be enlarged to gain full value of channel enlargement. Potential for further channel enlargement is good.

5. A combination of measures. Several combinations of the structural and non-structural measures discussed could be potential solutions to flooding problems in Ash Creek. A combination of measures could probably meet sponsors' objectives, other than flood protection, and/or be a less expensive solution. This combination could include critical area treatment, floodproofing, channel enlargement, and/or dikes. The measures together could reduce flood flows and elevations, protect residences and businesses from flood, reduce soil and streambank erosion and potentially provide added recreation areas. No combination of measures has been proposed in this Management Study, but other analyses indicate that greater benefits may be gained through groups of measures.

SPECIAL ALTERNATIVES CONSIDERED

This portion of the Ash Creek report briefly discusses some special analyses made involving specific management alternatives. These alternatives generally involve added hydraulic study and/or analysis of the study results. The analyses were done as a result of questions and comments raised by the study sponsors. No preliminary engineering designs or cost estimates were made, and no economic study of potential benefits was made.

The alternatives are discussed for each city area separately to facilitate understanding and potential action by each sponsor.

Independence Area

Specific alternatives considered in the area of the City of Independence were: (1) changes in the streambank and valley conditions; (2) alterations to Gun Club Road crossing; and (3) flood control dikes.

The channel is entrenched through much of this reach. Streambanks are thick with brush and blackberry bushes. Analyses were made to determine the effect upon flood elevations of establishing an open "greenway" in the creek valley. This greenway would be an open park during non-flood times. Because of high backwater conditions from the Willamette River, there is little effect of bank clearing from the outlet to a point upstream of Ash Street. Reductions of 0.5 to 1.5 feet could be realized above this point. This reduction would apply to all frequency storms.

Much greater reduction in flood depths would be realized in the reach below Gun Club Road, if there were high flow on Ash Creek while the Willamette River was not flooding. This would benefit some properties along this portion of the river and allow a quicker drainage of floodwaters upstream of Gun Club Road.

A floodway established to include the channel and additional flow area as needed to pass the 100-year flood would allow some filling of lands outside the floodway. A floodway would raise water levels near Gun Club Road by about one half foot if there were no change in streambank roughness. Establishing a floodway and also clearing away brush and blackberries would lower water levels to the present elevations or below.

Dikes could be built which would protect specific groups of houses and not cause significant increases in water elevation through the entire area. There are three areas in the Independence area where diking might be a proper alternative. Each of these have properties that are in the floodplain. The three areas are: (1) just upstream of the V&S railroad crossing on the south side of the creek; (2) at the Ash Brook subdivision north of the creek and east of Gun Club Road; and (3) along Rhoda Lane south of the creek near Gun Club Road. A dike three to four feet high could give protection to each of these areas from the 100-year flood. Diking in these areas could be a reasonable cost solution to local problems.

Gun Club Road has water flowing over it for all storms equal to and above a 10-year frequency. The 100-year flood would be five feet over the low point in the roadway. To eliminate flood overflow with no change to the bridge span, the road would need to be raised by eight feet. This would increase flood depth upstream of the bridge by about three feet. Added bridge openings could reduce the upstream flooding to approximately that experienced at present. This alternative has a fair implementation potential because of high cost.

A combination of the alternatives described possibly could be developed. The combination might include: (1) developing an open channel greenway; (2) diking selected areas; (3) enlarging Gun Club Road bridge; and, (4) raising the roadway on Gun Club Road. This group of measures could serve to meet objectives other than flood protection while providing flood damage reduction more economically.

Monmouth Area - Ash Creek and North Fork

Establishment of a floodway using dikes and an open greenway were also considerated for this reach of Ash Creek. Changes made in the creek downstream would have some effect upon this area either reducing or increasing the flood threat. Any works at Gun Club Road would have effect throughout much of this reach.

Major storms will overflow the channel between Hoffman Road and the sewage treatment lagoons and go into a drainageway to the north of the lagoons. This could be eliminated by increasing the height of the berms to establish dikes. Dikes should be built to withstand water pressure and erosive velocities in the Creek. They would need to be an average of three feet high and would establish one side of a floodway. Several acres of area now flooded by the overflow waters would be protected by the dikes. The areas are primarily in cropland at present, but are within the proposed Monmouth commercial/industrial zone.

A zone on the south side of the Creek between Hoffman Road and the junction with the Middle Fork could also be given flood protection by establishing dikes. Dikes generally would need to be higher than on the north side. A distance of approximately 100 feet between dikes would establish an adequate floodway. The area protected by the dike is also a designated commercial/industrial area.

The dikes and the area between could be maintained as an open greenway. Heavy brush and blackberries encroach on the channel in places and reduce the flood capacities. Clearing of this brush and planting grasses on the banks with trees and selected shrubs beside the bank would enhance the aesthetics of a greenway. Summer flows through this area are intermittent. This combination of dike and greenway park could have a good chance for implementation.

Those properties on the west side of Gun Club Road near Ash Creek are subject to flooding and would be influenced by any change to

that road. No specific studies were made of alternatives for protection; however, the problem would be reduced by eliminating flood overflow upstream. Also, the properties nearest the creek in Ash Creek Mobile Park upstream of Gun Club Road may be in danger of some flooding and/or damage from bank erosion. Studies indicate they are close to flood elevations.

Monmouth Area - Middle Fork Ash Creek

The possible development of a greenway was again considered on the Middle Fork. It would open the channel by removing debris and encroaching brush while leaving some trees. This would reduce flood depths some while providing a "strip park" area. There is a potential for developing one greenway or "strip park" from Riddell Road to the Willamette River. It could be developed with bike/jogging path and shaded areas to provide recreation open space as well as flood protection.

Alterations to eliminate flooding over the Riddell Road were considered. The 100-year flood would flood over the road by 0.3 feet but will flood over 650 feet of the road. Raising the road to eliminate this flooding would require over 2 feet of fill. Doubling of the present culvert size would lower upstream flood levels to below the present roadway. Alternatives between these two would give some lesser degree of flood protection.

Dallas Area - North Fork

Several segments of the North Fork Ash Creek below Monmouth Cutoff Highway have been cleared and enlarged in recent years, resulting in flow capacities at or near the 100-year flood. An active, regular maintenance program is necessary to keep the channel capacities at present levels. Growth of blackberries and brush on streambanks would reduce the capacity. Also, raised berms along the channel must be well maintained to continue to control flood flows.

The stream overflows to the south between the mill at Uglow Street and Monmouth Cutoff Highway. Diking of this segment was considered as an alternative. A two- to five-foot dike, or berm, would contain flows below Uglow Street; however, the bridge at Uglow Street is a constriction and would need to be enlarged and the roadway raised to keep flows in the channel.

With the flows of North Fork confined in the channel, flood flows and flooding would be reduced considerably in the tributary to North Fork, which was studied. Nearly half of the 100-year peak flow in that tributary is overflow water from North Fork. Natural flows in the tributary would have high water elevations over a foot lower than with the present flows.

The area of North Fork Ash Creek upstream of the Mill at Main Street is mainly in agricultural uses. Flooding in this area is not extensive and causes few problems, and no alternatives for controlling the flows were considered.

Previous studies have identified a possible storage site upstream of Dallas to control the flows in North Fork. It would be able to effectively control flood runoff and reduce flooding. It would be expensive to build, and the present damages with the improved channel probably could not support the construction costs. This is not considered a viable alternative at this time.

USDA PROGRAMS

There are several USDA program opportunities which could aid in evaluating and implementing the project measures discussed in the prior sections of this report. Project action is available through conservation operations, group planning special projects, resource conservation and development (RC&D), and the watershed protection (PL-566) program. Each of these programs would evaluate needs and problems more fully, determine viable solutions with costs and benefits, and determine potential federal cost sharing for implementing project measures. A strong local support is a key factor for getting federal support. Erosion and upstream flood problems in this creek coincide with the high priority objectives of the Soil Conservation Service.

The purpose of the Resource Conservation and Development (RC&D) program is to accelerate the conservation, development, and utilization of natural resources to improve the general level of economic activity, and to enhance the environment and standard of living in authorized RC&D areas. Authorized areas are locally sponsored areas designated by the Secretary of Agriculture for RC&D technical and financial assistance program funds. The Secretary of Agriculture, through authorities delegated to SCS and other USDA agencies, makes available to states, local units of government, and local nonprofit organizations, planning, design and cost share assistance necessary to operate and maintain an RC&D area. Polk County is in the Willamette RC&D project area.

The Watershed Protection and Flood Prevention Act, Public Law 83-566, Stat. 666, authorizes "the Secretary of Agriculture to cooperate with states and local agencies in the planning and carrying out of works of improvement for soil conservation and for other purposes." It provides for technical, financial, and credit assistance by the Department to local organizations representing the people living in small watersheds. It also provides for needed additional treatment and protection of federally owned lands within such watersheds. Moreover, the Act provides for a project-type approach to solving land, water, and related resource problems. It requires that full initiative and maximum responsibility for any undertaking be exercised by local people through their local organizations.

FLOODPLAIN MANAGEMENT APPENDICES

The Ash Creek Watershed map in the front of this report outlines the drainage area of the creek. It also highlights the portions of the creek studied.

The Index Map, Appendix A, shows the study area. The location and area covered by each of the five hazard maps is shown.

Appendix B contains the five flood hazard photomaps. These maps show the area inundated by the 100-year and 500-year floods. In the places where only the 100-year floodplain is indicated, the line represents both the 100-year and 500-year floodplains. This is because the two floodplains are so close together that only one line could be shown on the drawings. The location of each cross-section and the 100-year flood elevation at the section is also on the photomap. The flood elevations have been computed at each cross-section and the elevation between cross-sections has been interpolated. The floodplain maps were not field-checked by any instrument surveys.

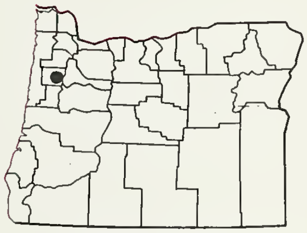
Some variation is possible in the area flooded by a particular storm due to several conditions. Slight flooding may occur outside the mapped floodplain due to a tributary drain or other concentrated local runoff from areas adjacent to the floodplain. Debris buildup in the creek could cause locally higher flood levels where they occur. This study is not able to consider the potential effect of the debris dams. It is possible that islands may exist within the floodplain that do not show on the photomaps. Some buildings which are within the flood area may have floor levels above the flood levels. The maps are intended to show the general ground elevations. To determine the flooding potential at a specific location, a field survey would be required using the computed or interpolated flood elevations.

Water surface profiles of the portions studied have been prepared and are included as Appendix C. The 10-, 100- and 500-year flood profiles are plotted. Flood elevations between cross-sections can be determined from the profiles. The stationing and distance between sections is measured along the centerline of the creek. Stream bottom elevations at each section and bridge girder and roadway elevations are given on the profiles.

Appendix D is a tabulation of the cross section data and flood elevations which were used to develop the Flood Hazard Maps (Appendix B) and Flood Profiles (Appendix C). Investigations and Analyses (Appendix E) describe the technical studies which were done in the development of the maps and this report. This section also discusses the criteria for establishing a floodway portion of the creek.

Also included in this report are Bibliography (Appendix F) and Glossary (Appendix G).

5 PHOTOMAP AREA AND NUMBER



VICINITY MAP

APPENDIX A

INDEX TO MAP SHEETS

ASH CREEK

FLOOD PLAIN MANAGEMENT STUDY

POLK COUNTY, OREGON

0 1 2 3 4

MILES

0 1 2 3 4

KILOMETERS

APPENDIX A

INDEX TO MAP SHEETS
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY
POLK COUNTY, OREGON

LEGEND

PROPOSED FLOODWAY

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

230.5 M-10 CROSS SECTION WITH 100-YEAR FLOOD ELEV.

MAP PREPARED 1985

NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 DATA MAP PHOTOGRAPHY

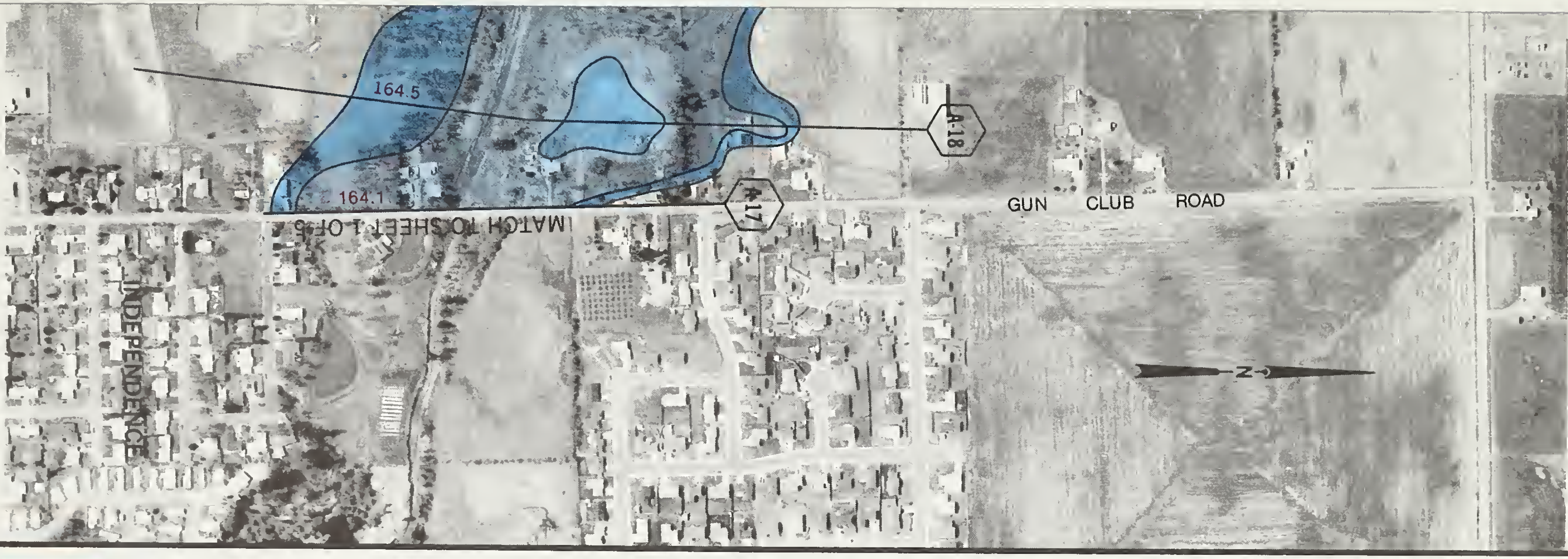
SHEET 1 OF 5

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

FLOOD HAZARD AREA

ASH CREEK

R 4 W
GUN CLUB ROAD
ASH BROOK
MATCH TO SHEET 2 OF 5
RHODA LANE
HAZEL GLEN COURT
MONMOUTH INDEPENDENCE HWY. 43
Ash Creek
A STREET
ASH ST
STATE HIGHWAY 51
BEGIN STUDY
MAIN STREET
INDEPENDENCE
T 8 S
A-2
A-3
A-4
A-5
A-6
A-7
A-8
A-9
A-10
A-11
A-12
A-13
A-14
A-15
A-16
A-17
S-1
S-2
S-3
S-4
S-5
S-6
S-7
164.1
163.8
162.7
162.4
158.7
158.0
SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE
1982 DATA MAP PHOTOGRAPHY
NOTE
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION
CROSS SECTION WITH 100-YEAR FLOOD ELEV
MAP PREPARED 1985
LEGEND
500-YEAR FLOOD BOUNDARY
100-YEAR FLOOD BOUNDARY
PROPOSED FLOODWAY
FLOOD HAZARD AREA
ASH CREEK
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON
SHEET 1 OF 5
DECEMBER 1985 4-R-39500
USDA-SCS-FORT WORTH, TEXAS 1985



LEGEND

PROPOSED FLOODWAY

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

230.5 M-10 CROSS SECTION WITH 100-YEAR FLOOD ELEV.

MAP PREPARED 1985

NOTE:
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SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 DATA MAP PHOTOGRAPHY

SHEET 2 OF 5

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

FLOOD HAZARD AREA

ASH CREEK

DECEMBER 1985 4-R-39500

USDA SCS-FORT WORTH, TEXAS 1985

LEGEND

PROPOSED FLOODWAY

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

230.5 (M-10) CROSS SECTION WITH 100-YEAR FLOOD ELEV.

MAP PREPARED 1985

NOTE:
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SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 DATA MAP PHOTOGRAPHY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

FLOOD HAZARD AREA

ASH CREEK

SHEET 3 OF 5

NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION

SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 DATA MAP PHOTOGRAPHY

MAP PREPARED 1985

LEGEND

PROPOSED FLOODWAY

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

230.5 CROSS SECTION WITH 100-YEAR FLOOD ELEV.

FLOOD HAZARD AREA

ASH CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

SHEET 3 OF 5

DECEMBER 1985 4-R-39500

USDA-SCS-FORT WORTH, TEXAS 1985

LEGEND

PROPOSED FLOODWAY

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

230.5 M-10 CROSS SECTION WITH 100-YEAR FLOOD ELEV.

MAP PREPARED 1985

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SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 DATA MAP PHOTOGRAPHY

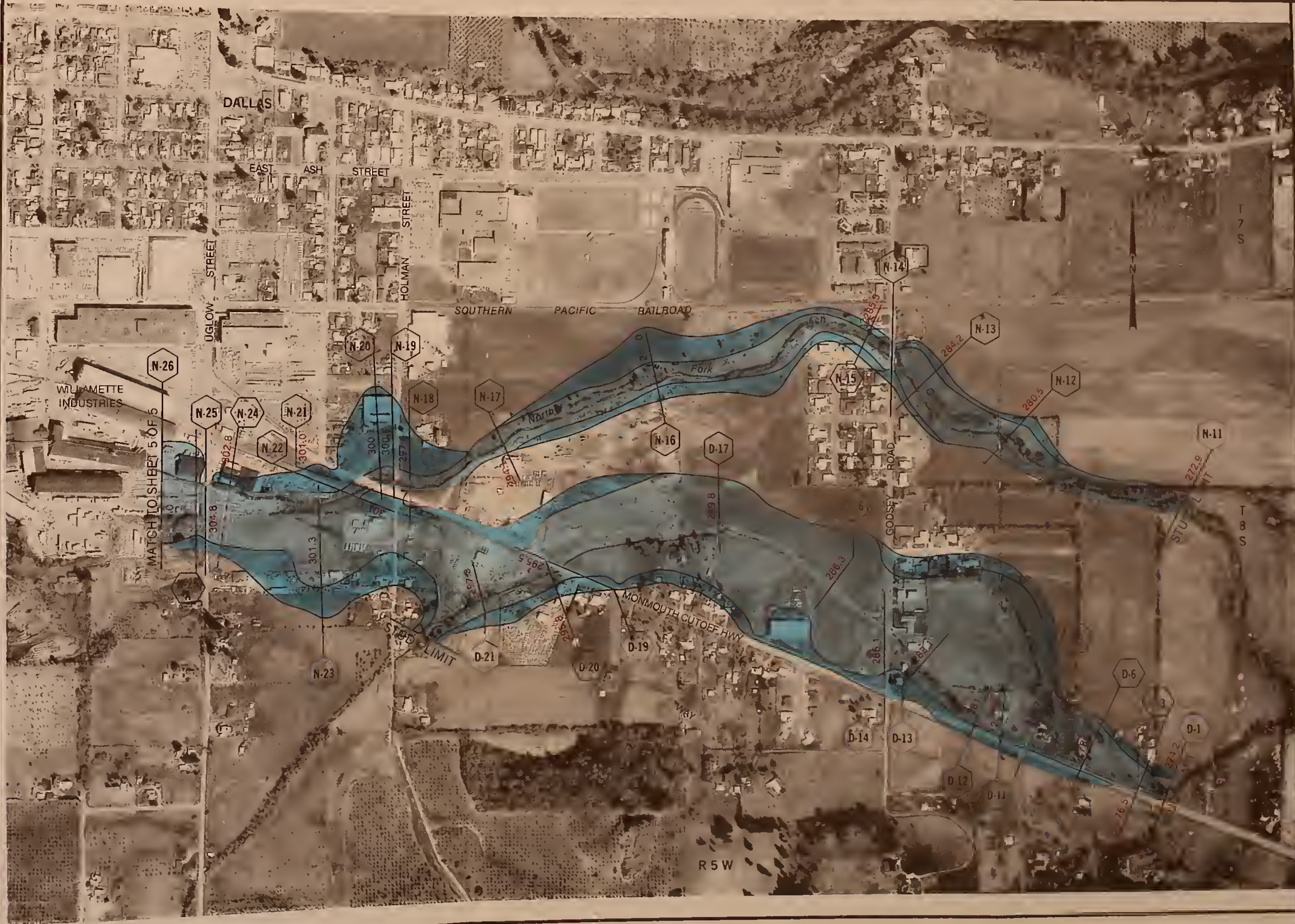
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

FLOOD HAZARD AREA

ASH CREEK

SHEET 4 OF 5

DECEMBER 1985 4-R-39500



LEGEND

PROPOSED FLOODWAY

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

230.5 N-10 CROSS SECTION WITH 100-YEAR FLOOD ELEV

MAP PREPARED 1985

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SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 DATA MAP PHOTOGRAPHY

FLOOD HAZARD AREA

ASH CREEK

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

SHEET 4 OF 5

USDA-SCS-FORT WORTH, TEXAS 1985

LEGEND

PROPOSED FLOODWAY | 100-YEAR FLOOD BOUNDARY | 500-YEAR FLOOD BOUNDARY

230.5 M-10 CROSS SECTION WITH 100-YEAR FLOOD ELEV.

MAP PREPARED 1985

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SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 DATA MAP PHOTOGRAPHY

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

FLOOD HAZARD AREA

ASH CREEK

DECEMBER 1985 4-R-39500

FLOOD HAZARD AREA

ASH CREEK

LEGEND

PROPOSED FLOODWAY

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

230.5 N-10 CROSS SECTION WITH 100-YEAR FLOOD ELEV

MAP PREPARED 1985

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SCALE 0 500 1000 FEET
0 100 200 300 METERS
APPROXIMATE

1982 OETA MAP PHOTOGRAPHY

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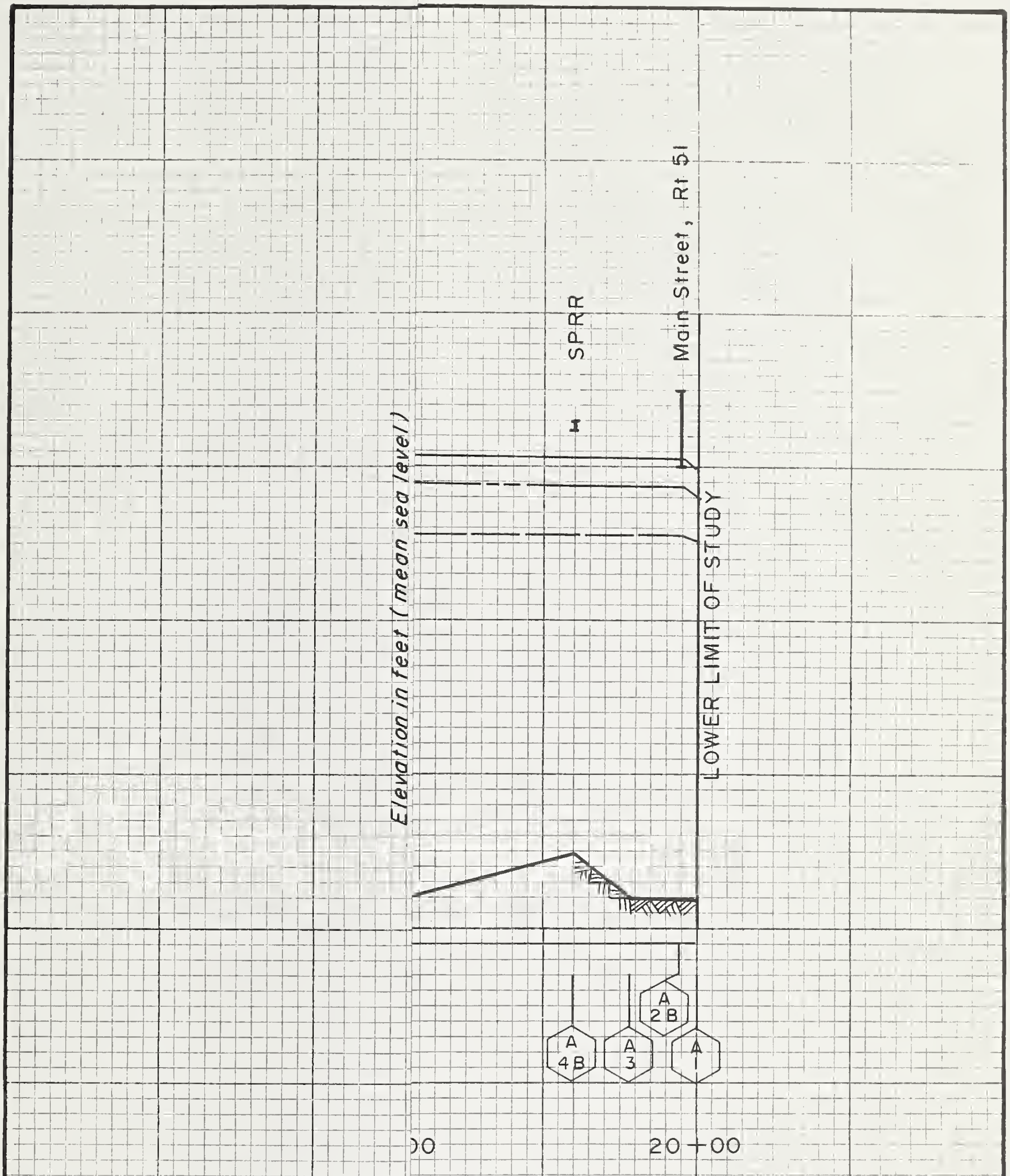
SOIL CONSERVATION SERVICE
ASH CREEK
FLOOD PLAIN MANAGEMENT STUDY AREA
POLK COUNTY, OREGON

SHEET 5 OF 5

DECEMBER 1985 4-R-39500

USDA SCS FORT WORTH, TEXAS 1985



Appendix C sheet 1 of 10

LEGEND

————————	500 Year Flo
———— – – ————	100 Year Flo
– – – – – – – –	10 Year Flo
(hatched line)	Channel Bottor
A 20	Cross Sectior

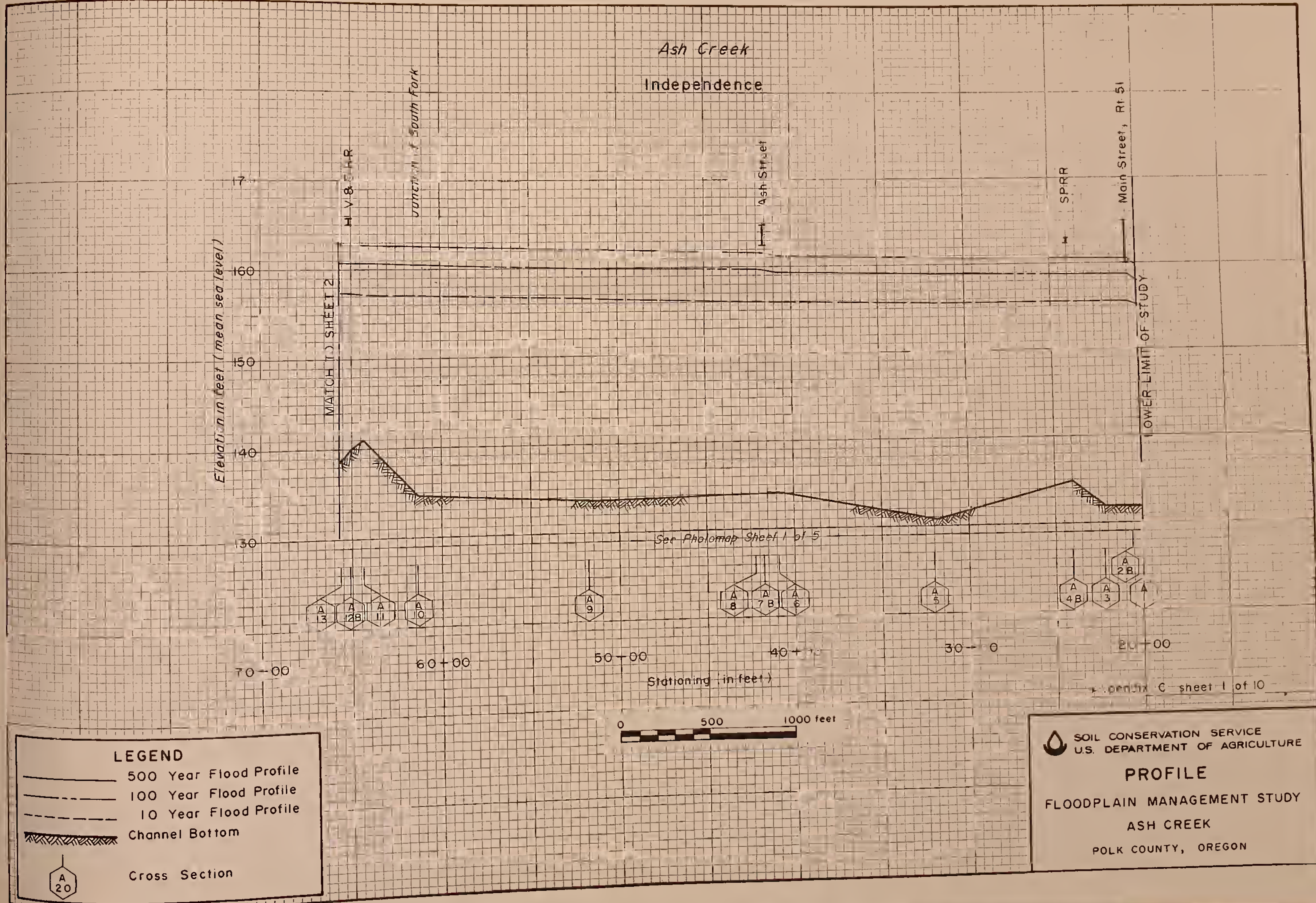
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

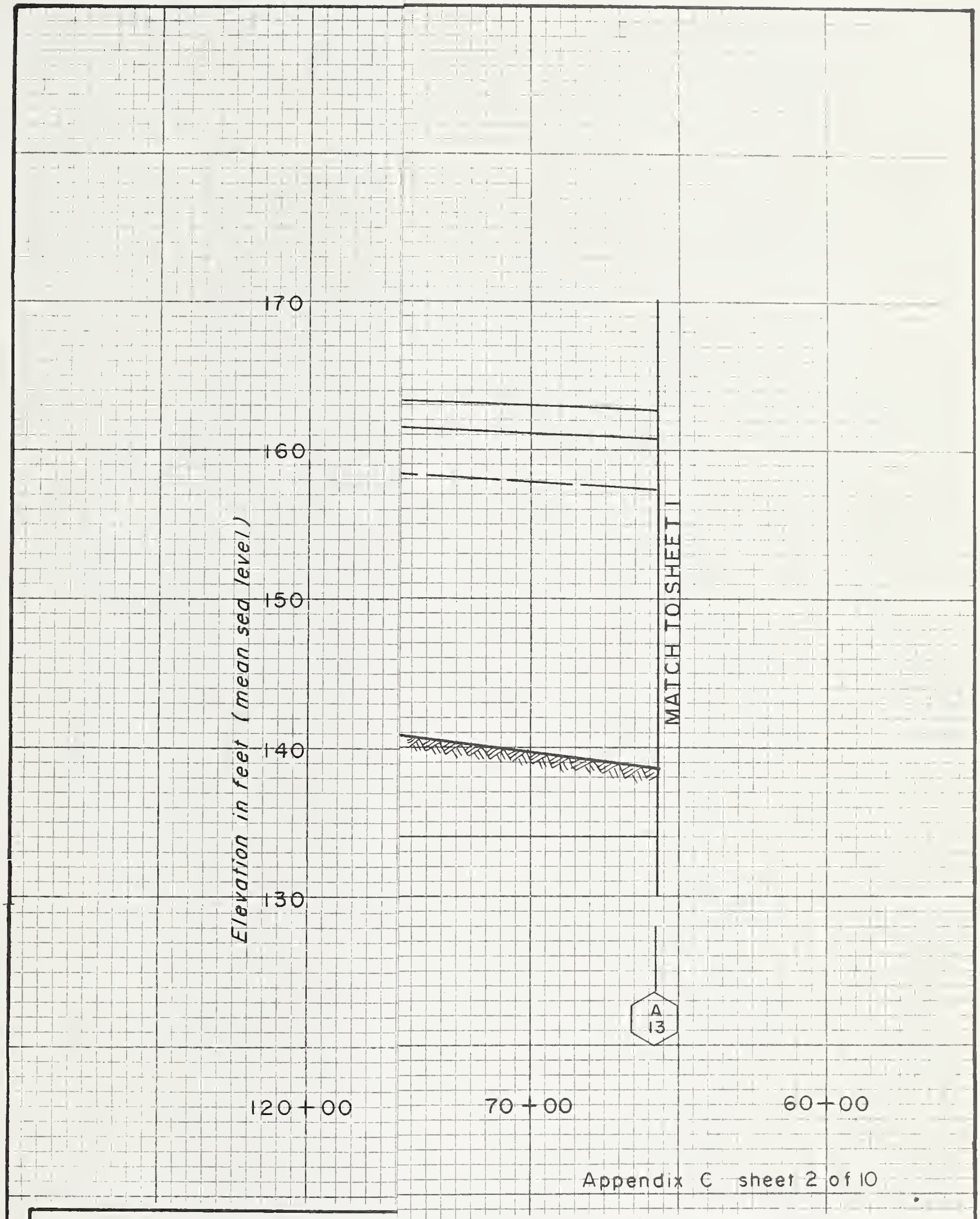
PROFILE

FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON

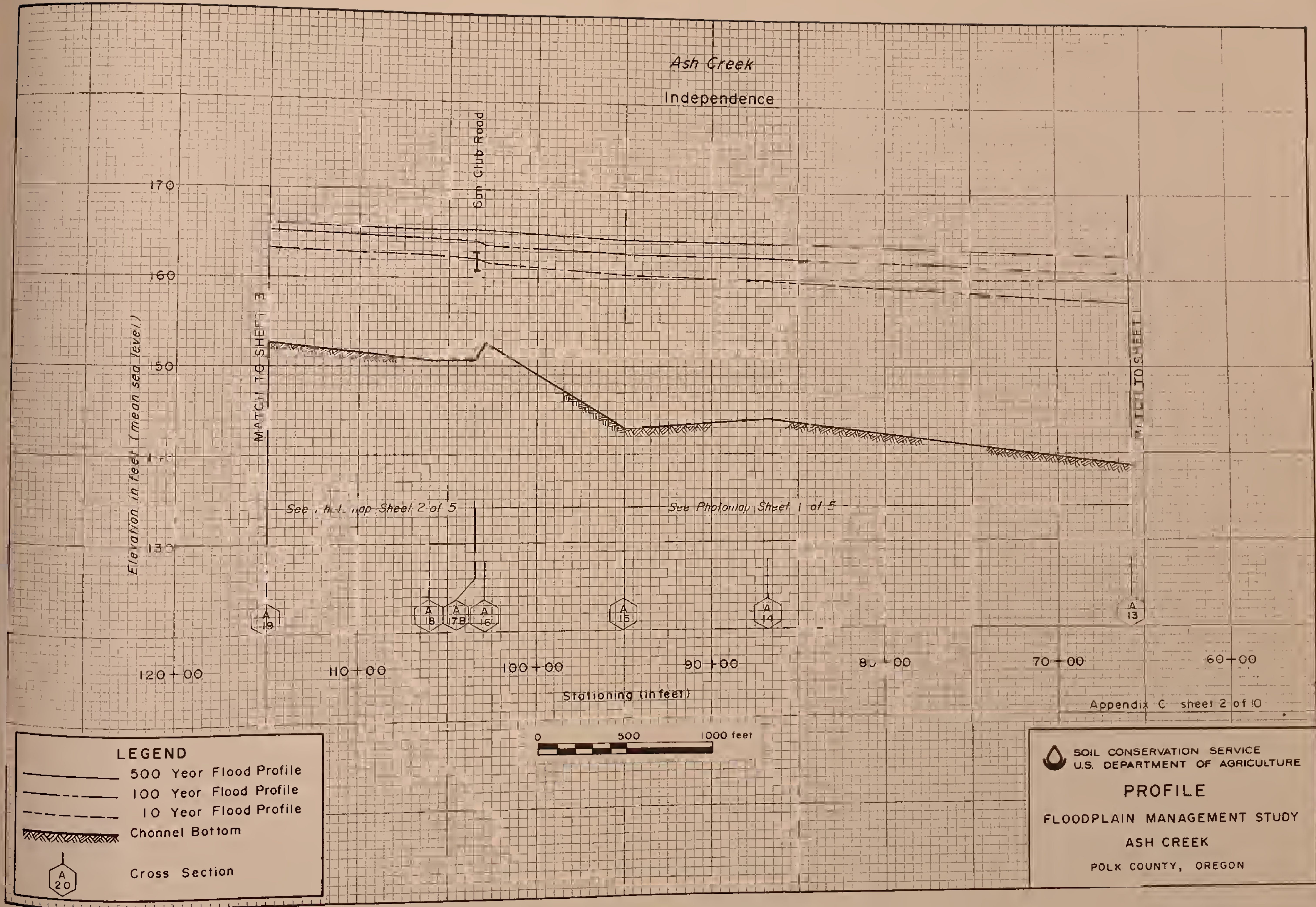

Ash Creek
Independence
H.V.& E.R.
Junction of South Fork
Ash Street
SPRR
Main Street, Rt 51
MATCH TO SHEET 2
LOWER LIMIT OF STUDY
Elevation in feet (mean sea level)
160
150
140
130
See Photomap Sheet 1 of 5
A 13
A 12B
A 11
A 10
A 9
A 8
A 7B
A 6
A 5
A 4B
A 3
A 2B
A
70+00
60+00
50+00
40+
30+00
20+00
Stationing (in feet)
0
500
1000 feet
Appendix C sheet 1 of 10
LEGEND
500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
A 20
Cross Section
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PROFILE
FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



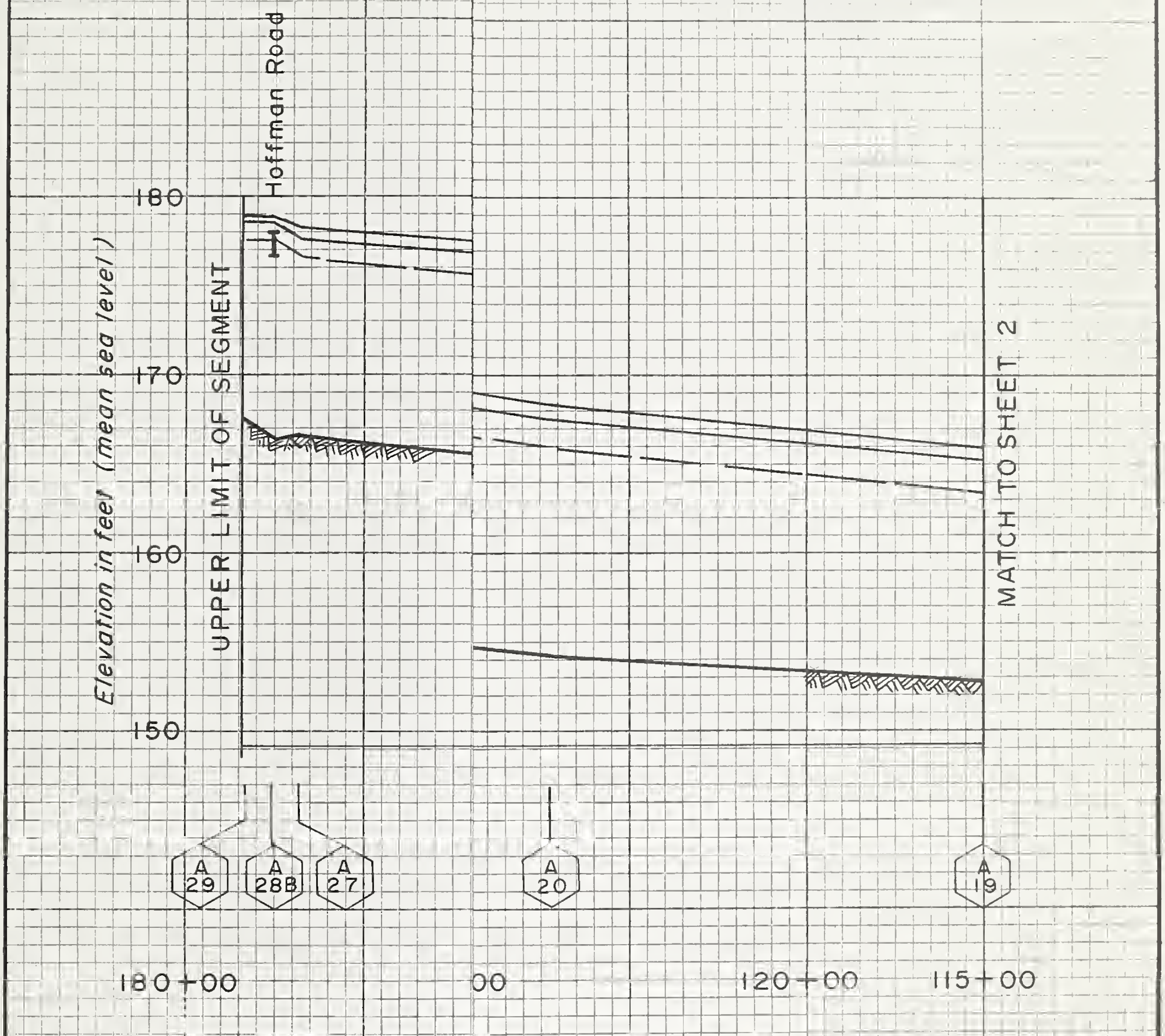
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



Ash Creek
Independence
Gun Club Road
170
160
150
130
Elevation in feet (mean sea level)
MATCH TO SHEET 3
MATCH TO SHEET 1
Sheet 2 of 5
See Photomap Sheet 1 of 5
A 19
A 18
A 17B
A 16
A 15
A 14
A 13
120+00
110+00
100+00
90+00
70+00
60+00
Stationing (in feet)
Appendix C sheet 2 of 10
0
500
1000 feet
LEGEND
500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
A 20
Cross Section
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PROFILE
FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



Appendix C sheet 3 of 10

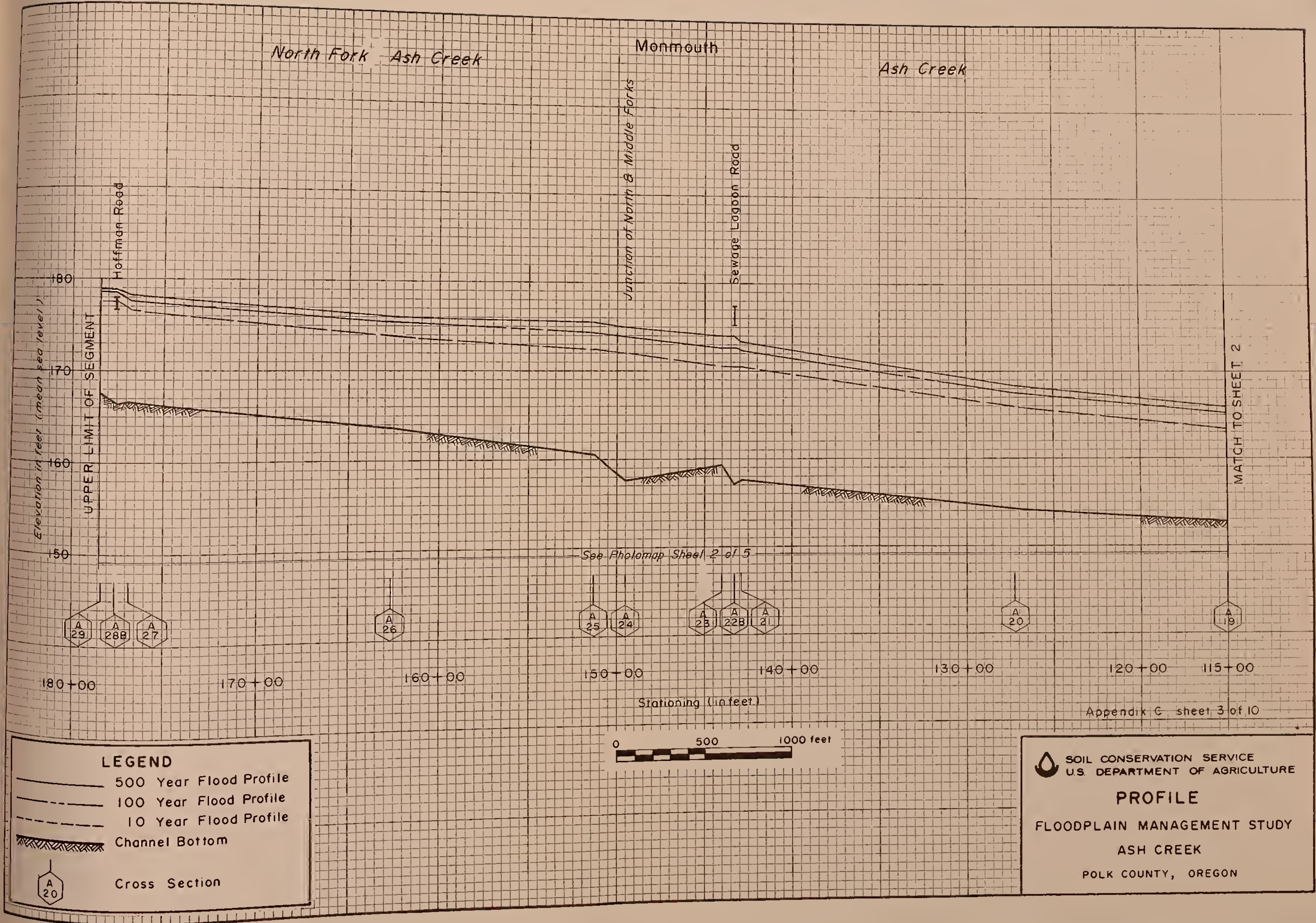
LEGEND

500 Year Flo
100 Year Flo
10 Year Flo
Channel Bottor
Cross Section

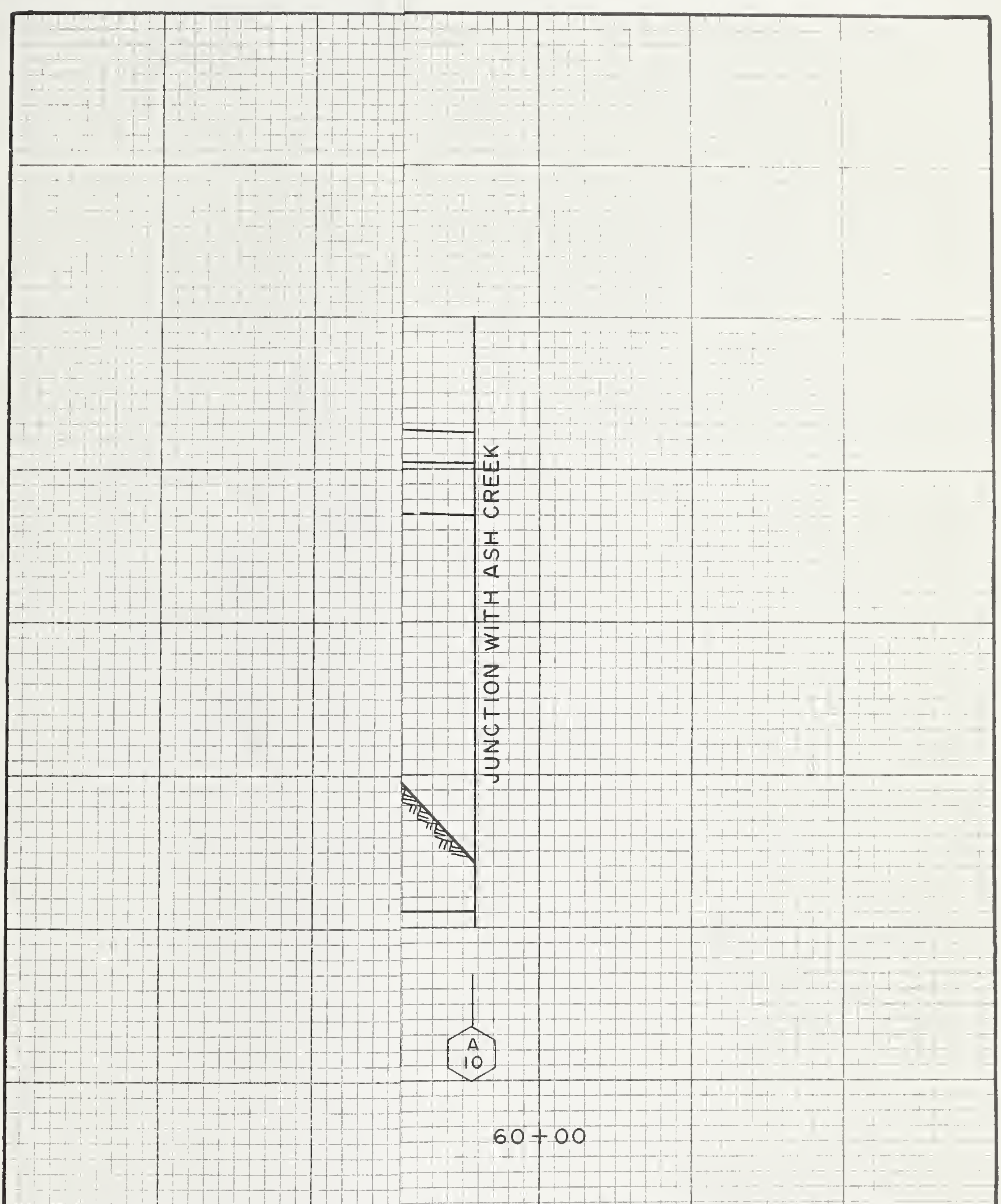
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



North Fork Ash Creek
Monmouth
Ash Creek
Hoffman Road
Junction of North & Middle Forks
Sewage Lagoon Road
UPPER LIMIT OF SEGMENT
MATCH TO SHEET 2
Elevation in feet (mean sea level)
180
170
160
150
See Photomap Sheet 2 of 5
A 29
A 28B
A 27
A 26
A 25
A 24
A 23
A 22B
A 21
A 20
A 19
180+00
170+00
160+00
150+00
140+00
130+00
120+00
115+00
Stationing (in feet)
Appendix C sheet 3 of 10
0
500
1000 feet
LEGEND
500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
A 20
Cross Section
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PROFILE
FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



Appendix C sheet 4 of 10

LEGEND

- 500 Year Flo
- 100 Year Flo
- 10 Year Flo
- Channel Bottor
- A 20 Cross Section

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

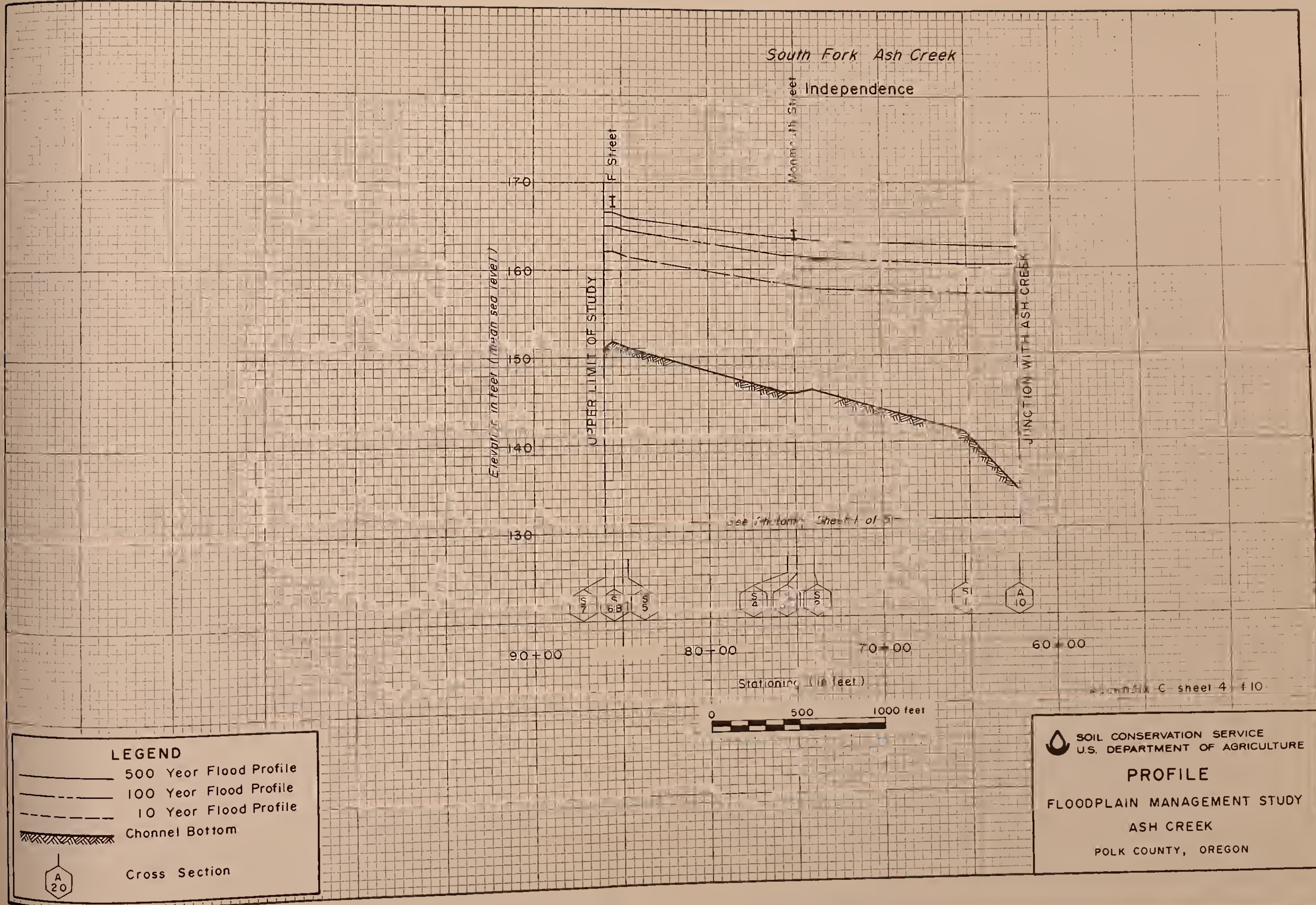
PROFILE

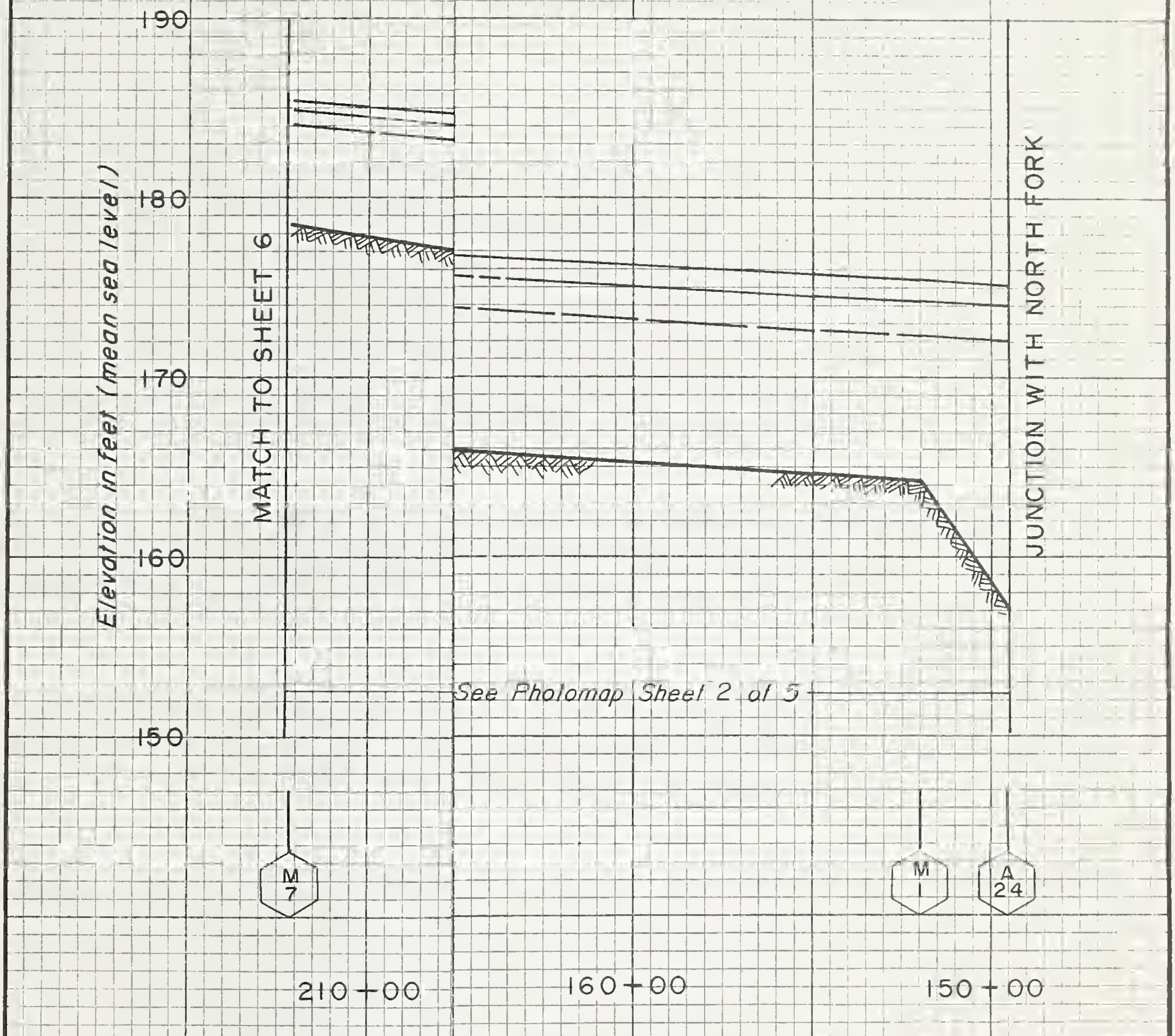
FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON

4


South Fork Ash Creek
Independence
F Street
UPPER LIMIT OF STUDY
JUNCTION WITH ASH CREEK
170
160
150
140
130
90+00
80+00
70+00
60+00
0
500
1000 feet
LEGEND
500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
Cross Section
A
20
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PROFILE
FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



Appendix C sheet 5 of 10

LEGEND

- 500 Year Fl
- 100 Year Fl
- 10 Year Fl
- Channel Bott
- A 20 Cross Sectio

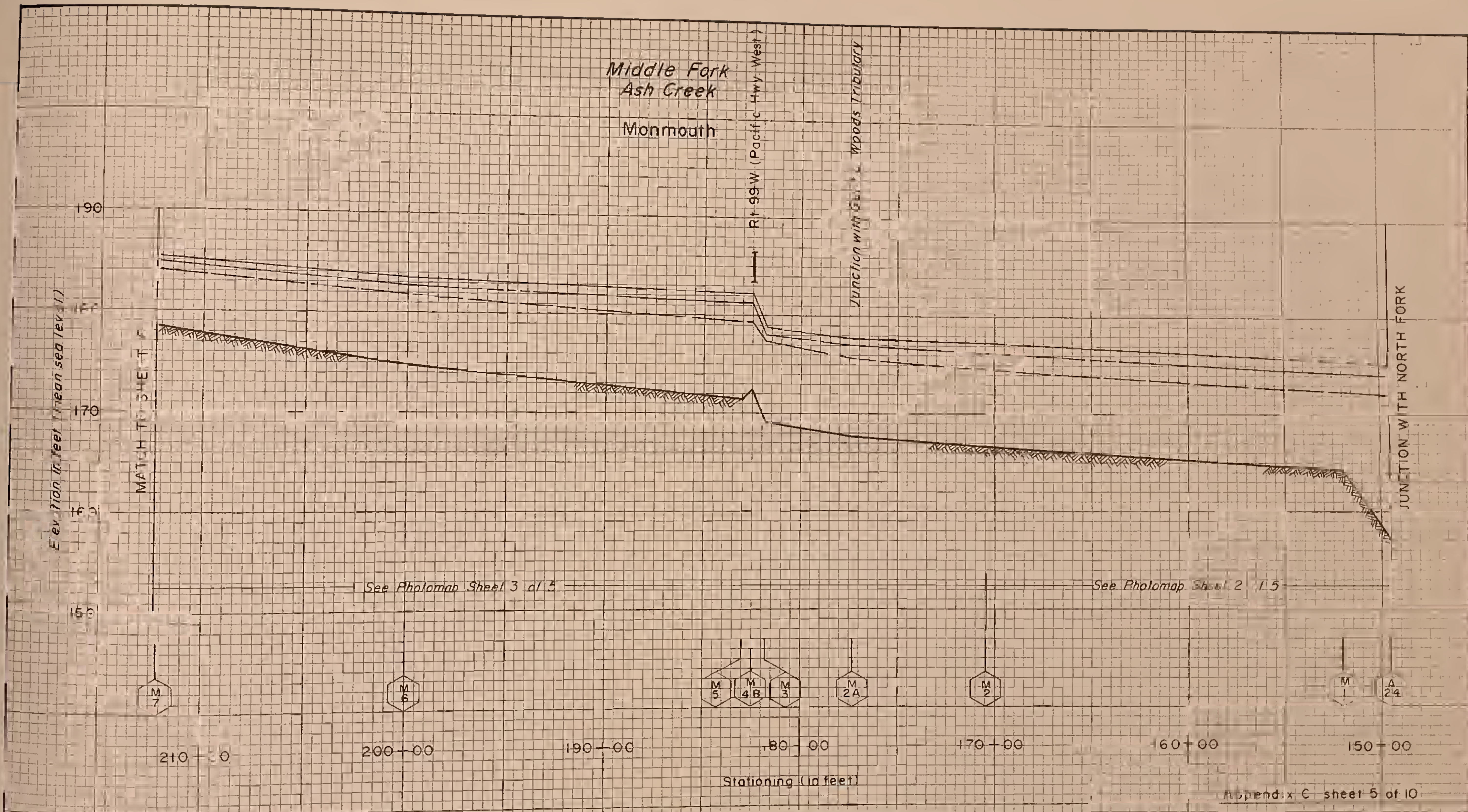
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON



Appendix C sheet 5 of 10

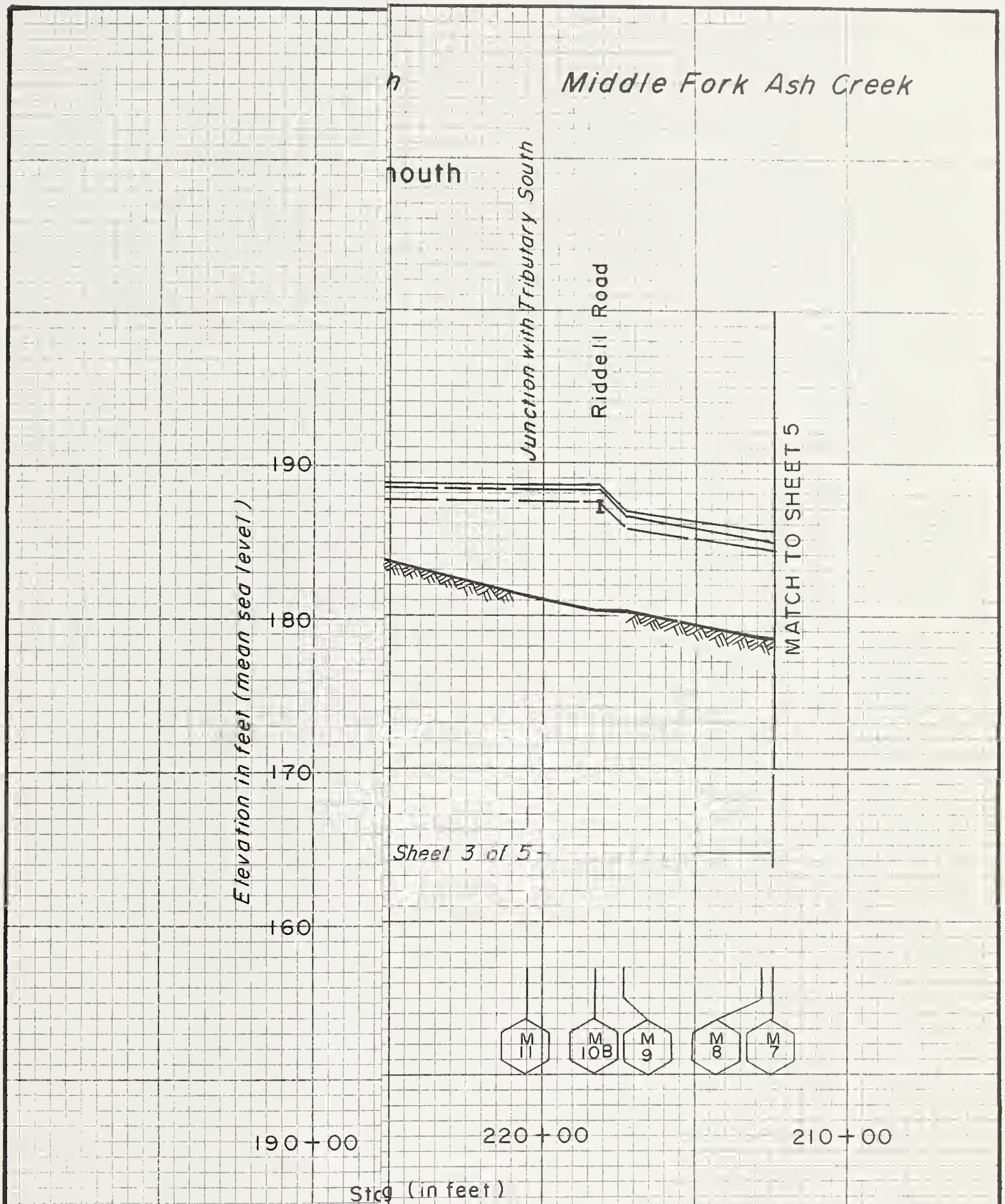
LEGEND

500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
A 20 Cross Section

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



Appendix C sheet 6 of 10

LEGEND

500 Year F
100 Year F
10 Year F
Channel Bott
A 20 Cross Secti

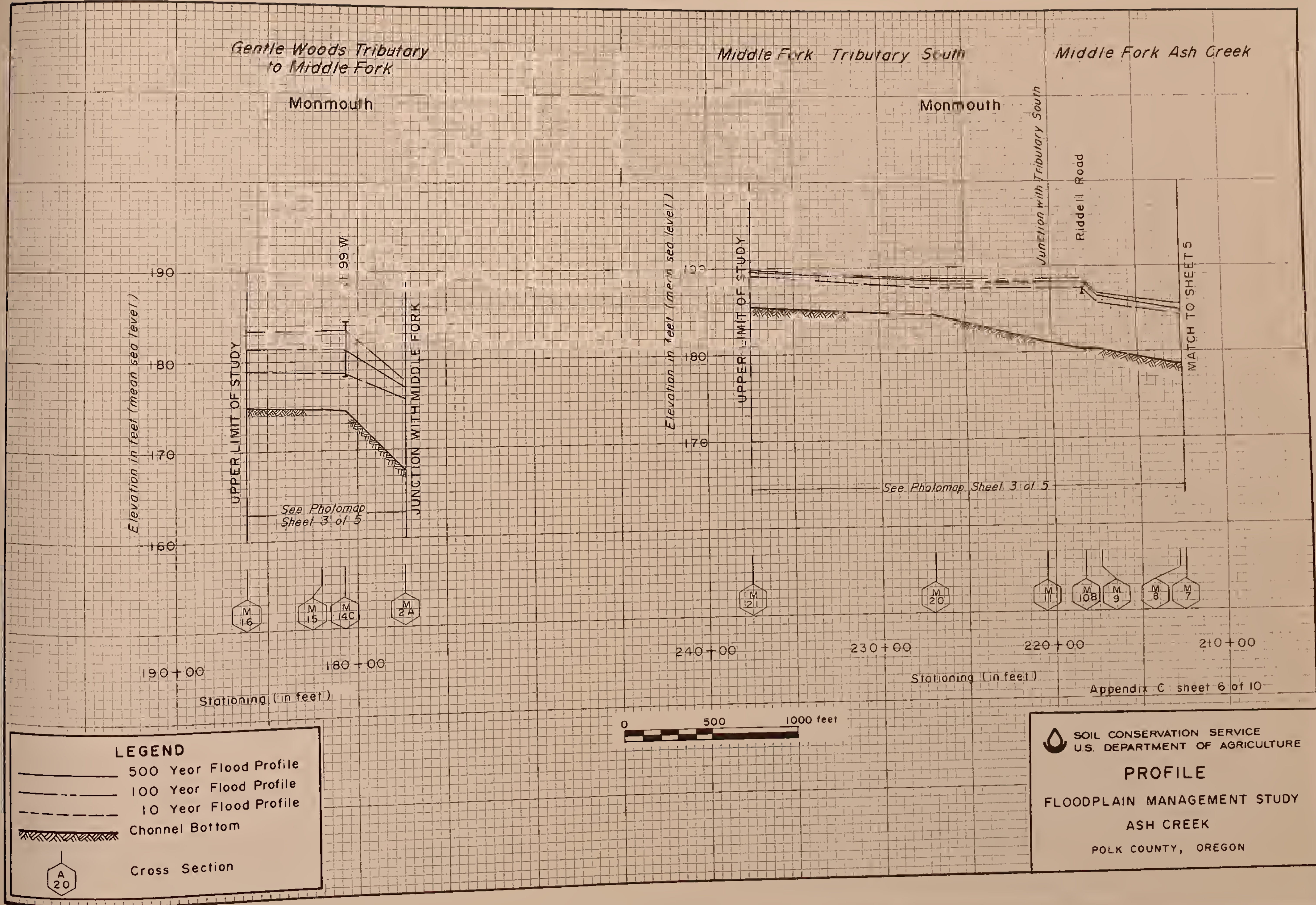
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

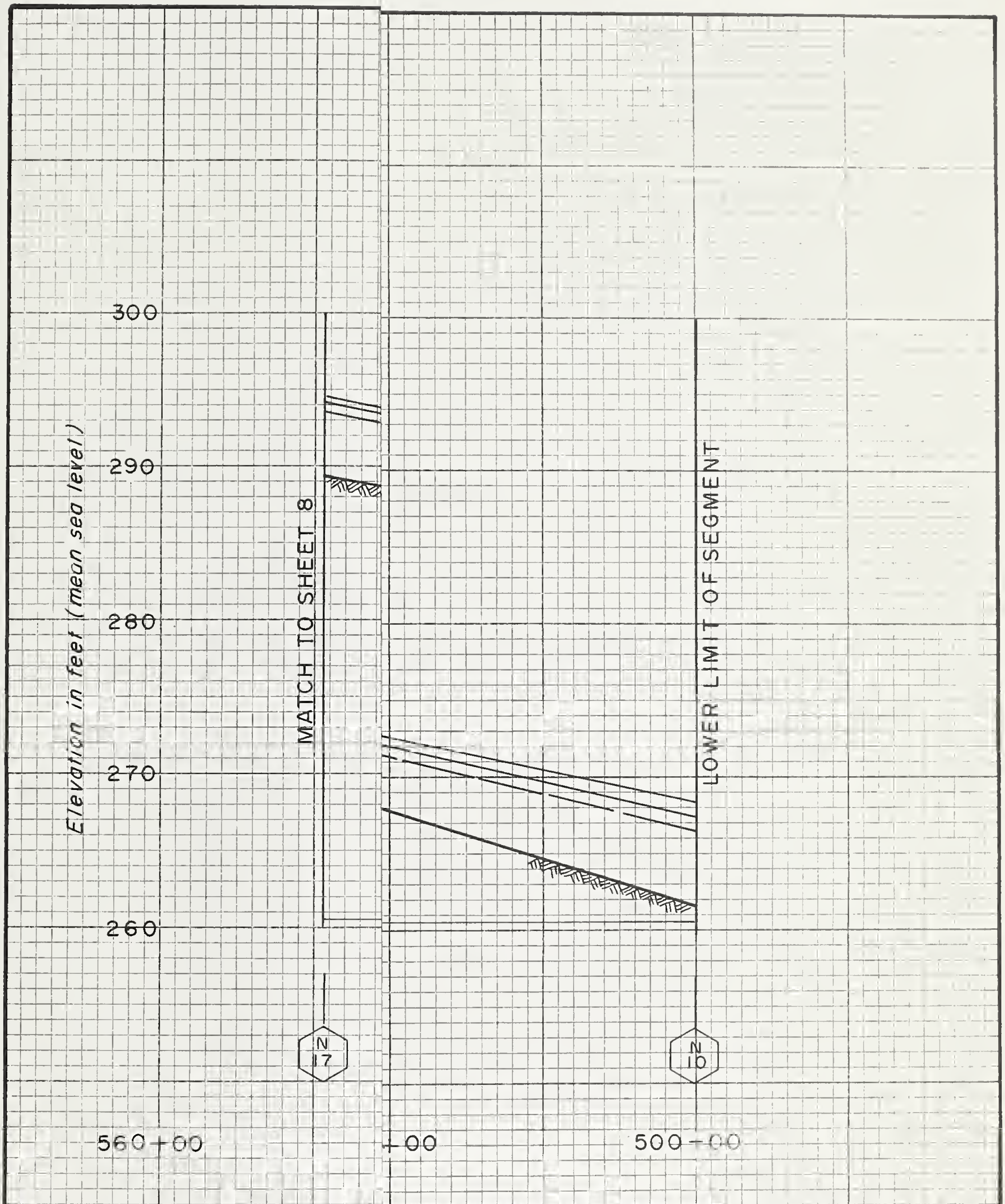
FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON



Gentle Woods Tributary to Middle Fork
Monmouth
Middle Fork Tributary South
Middle Fork Ash Creek
Monmouth
Junction with Tributary South
Riddell Road
MATCH TO SHEET 5
99 W
UPPER LIMIT OF STUDY
JUNCTION WITH MIDDLE FORK
Elevation in feet (mean sea level)
190
180
170
160
See Photomap Sheet 3 of 5
M 16
M 15
M 14C
M 2A
M 21
M 20
M 11
M 10B
M 9
M 8
M 7
190+00
180+00
240+00
230+00
220+00
210+00
Stationing (in feet)
Appendix C sheet 6 of 10
0
500
1000 feet
LEGEND
500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
A 20
Cross Section
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PROFILE
FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



Appendix C sheet 7 of 10

LEGEND

500 Year F
100 Year F
10 Year F
Channel Bott
Cross Sectic

A 20

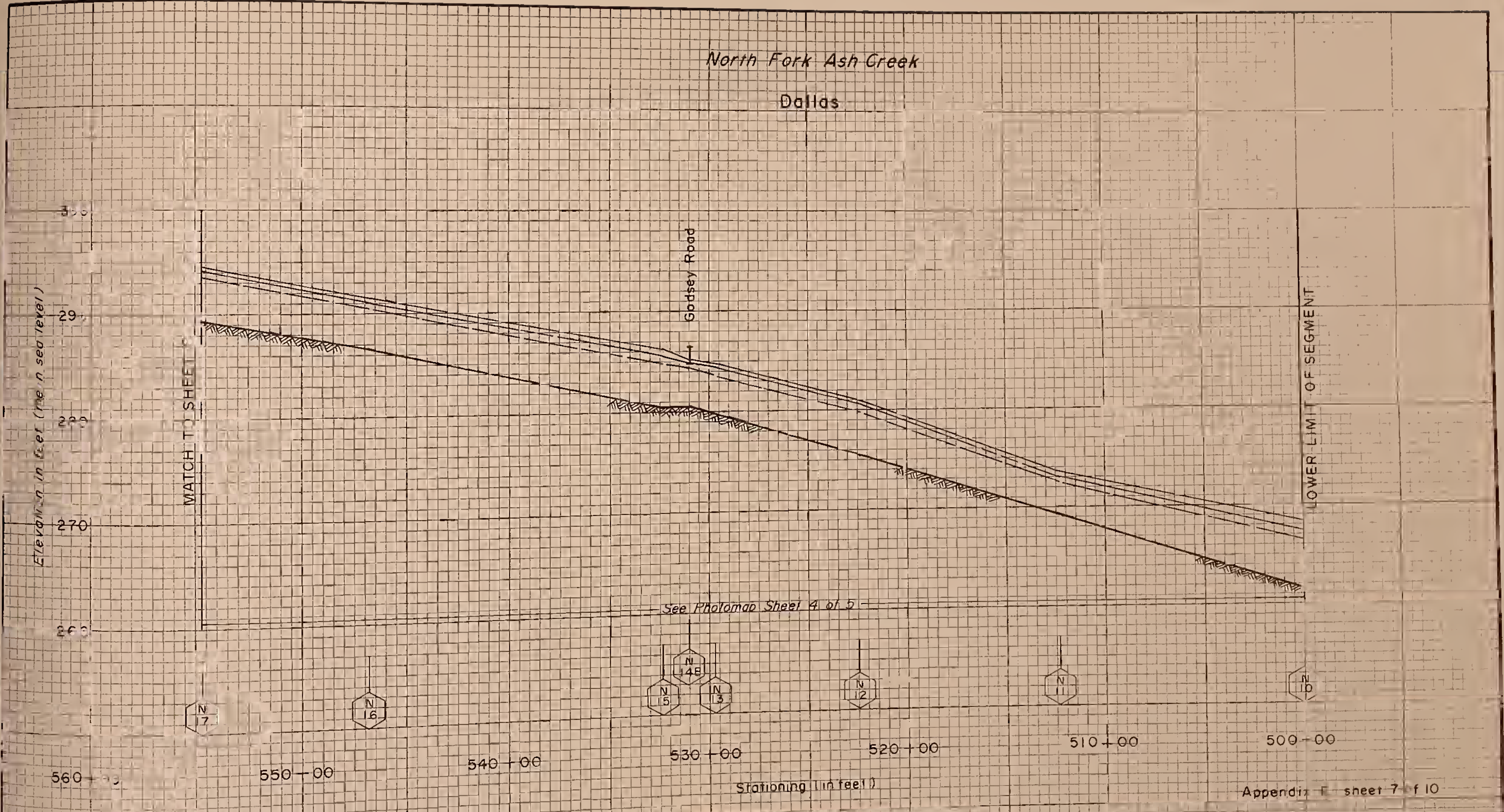
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON



Appendix E sheet 7 of 10

0 500 1000 feet

LEGEND

500 Year Flood Profile

100 Year Flood Profile

10 Year Flood Profile

Channel Bottom

A 20 Cross Section

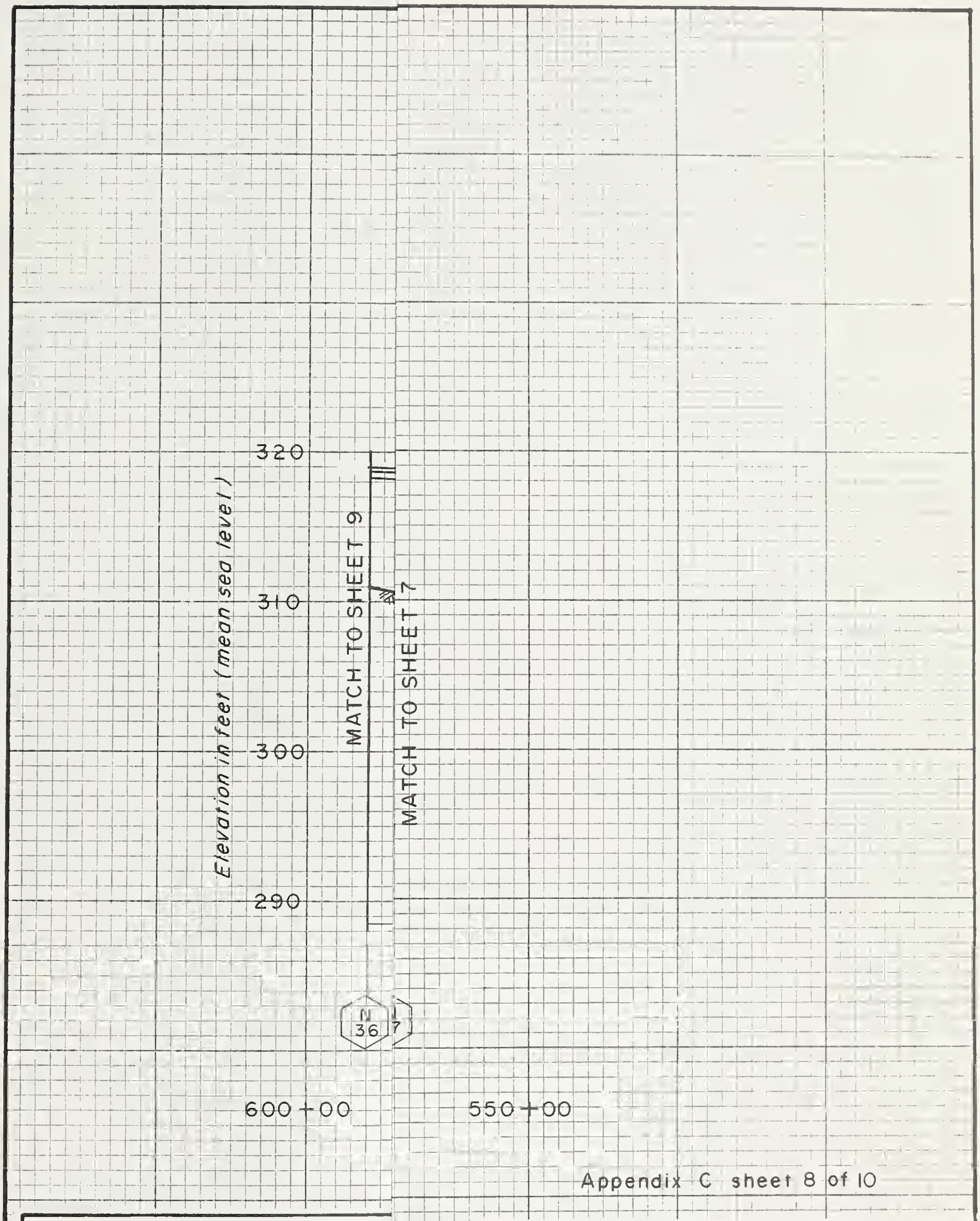
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON



LEGEND

- 500 Year Flo
- 100 Year Flo
- 10 Year Flo
- Channel Botto
- A 20 Cross Sectio

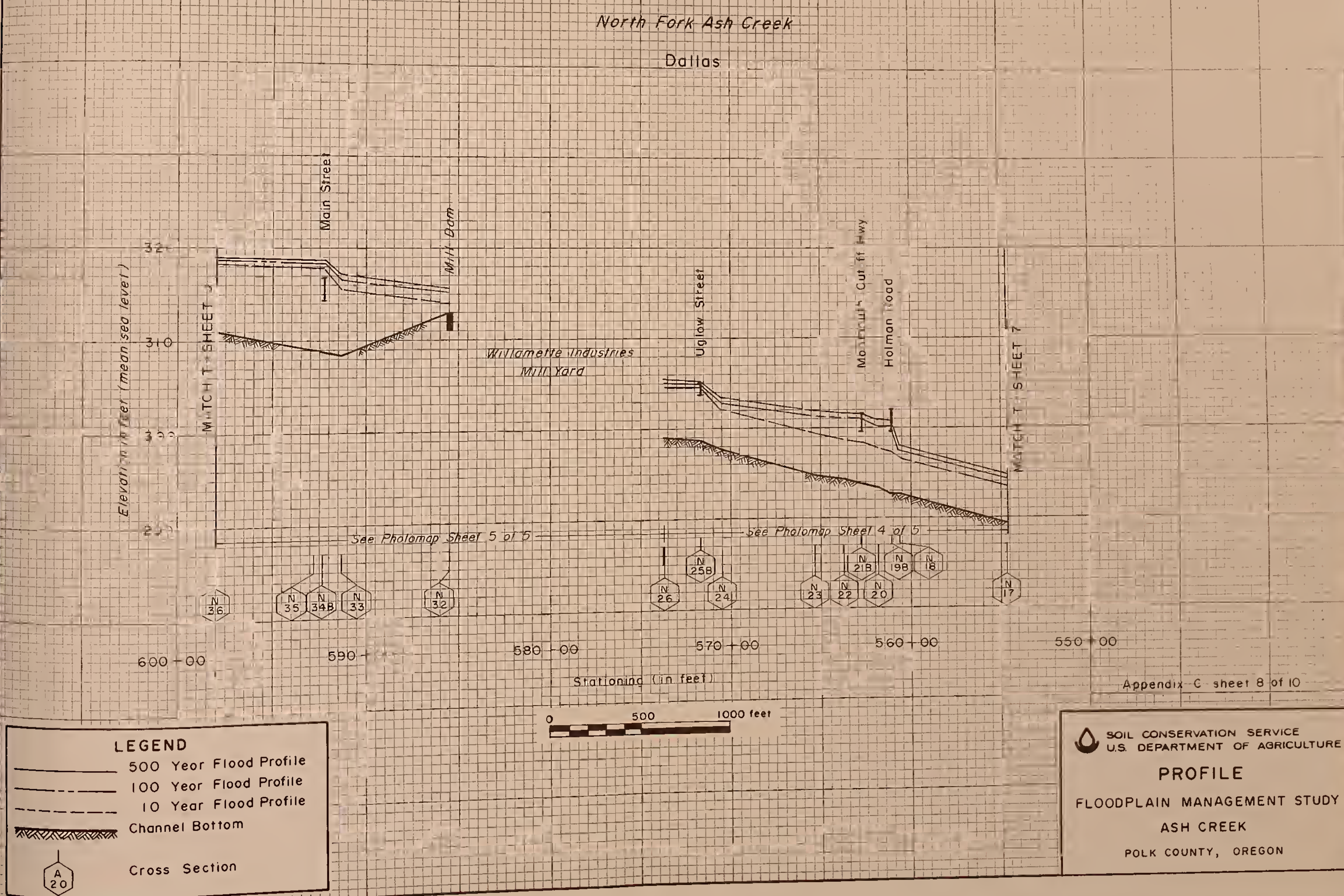
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON



Appendix C sheet 8 of 10

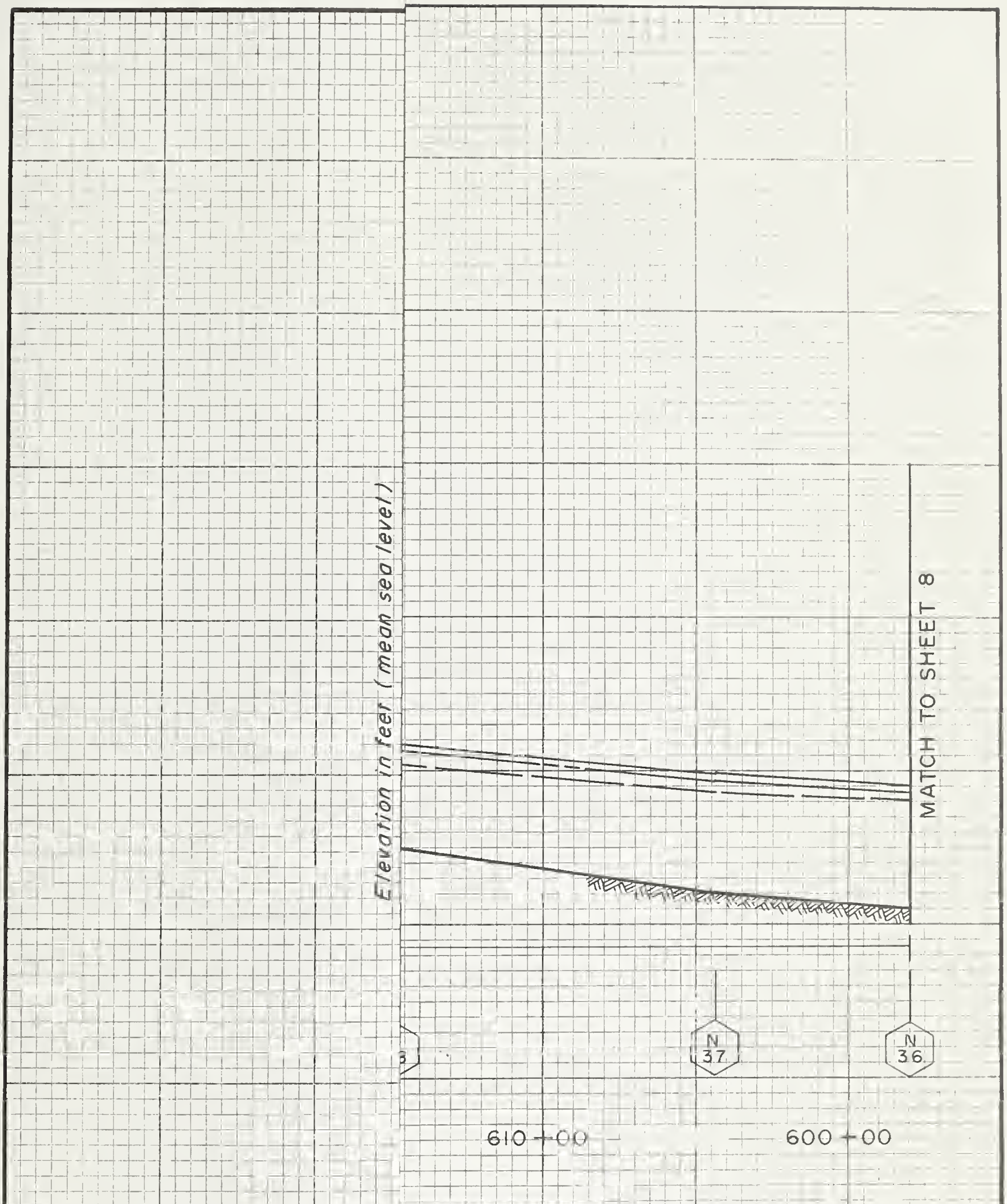
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY

ASH CREEK

POLK COUNTY, OREGON



Appendix C sheet 9 of 10

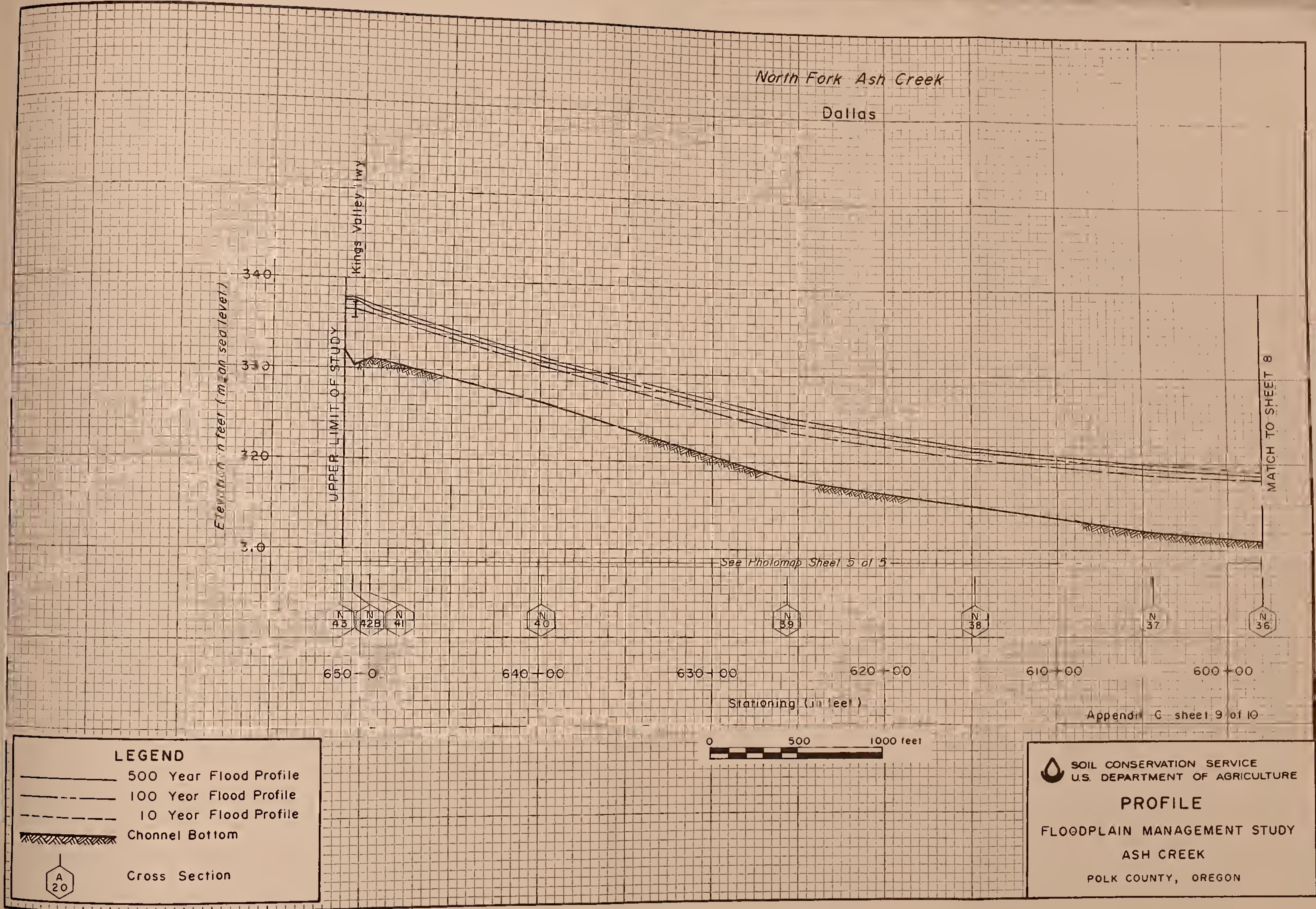
LEGEND

500 Year Flc
100 Year Flc
10 Year Flc
Channel Botto
A 20 Cross Sectior

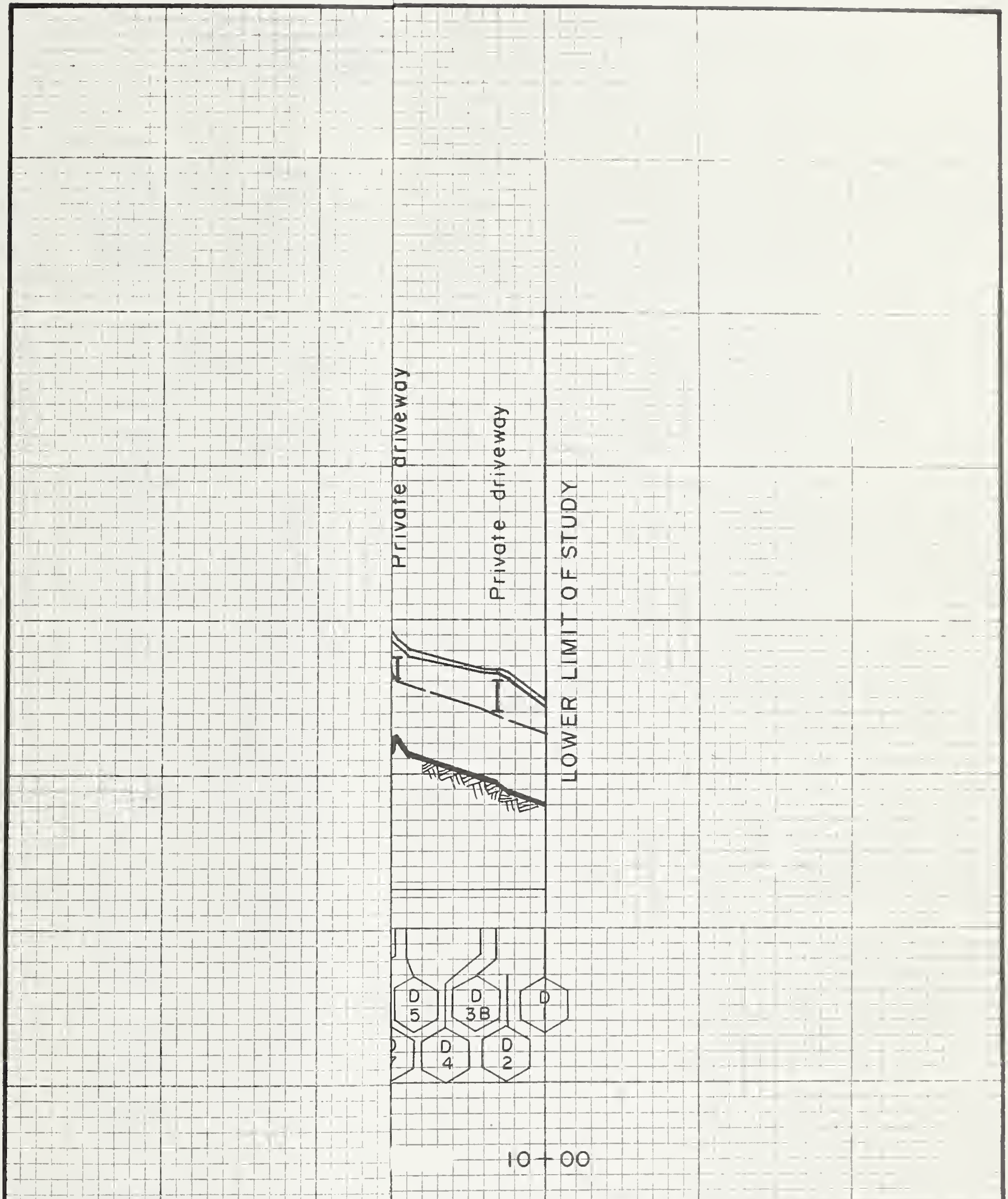
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



North Fork Ash Creek
Dallas
Kings Valley Hwy
UPPER LIMIT OF STUDY
MATCH TO SHEET 8
Elevation in feet (mean sea level)
340
330
320
310
See Photomap Sheet 5 of 5
N 43
N 42B
N 41
N 40
N 39
N 38
N 37
N 36
650+00
640+00
630+00
620+00
610+00
600+00
Stationing (in feet)
Appendix C sheet 9 of 10
0
500
1000 feet
LEGEND
500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
A 20
Cross Section
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PROFILE
FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON



Appendix C sheet 10 of 10

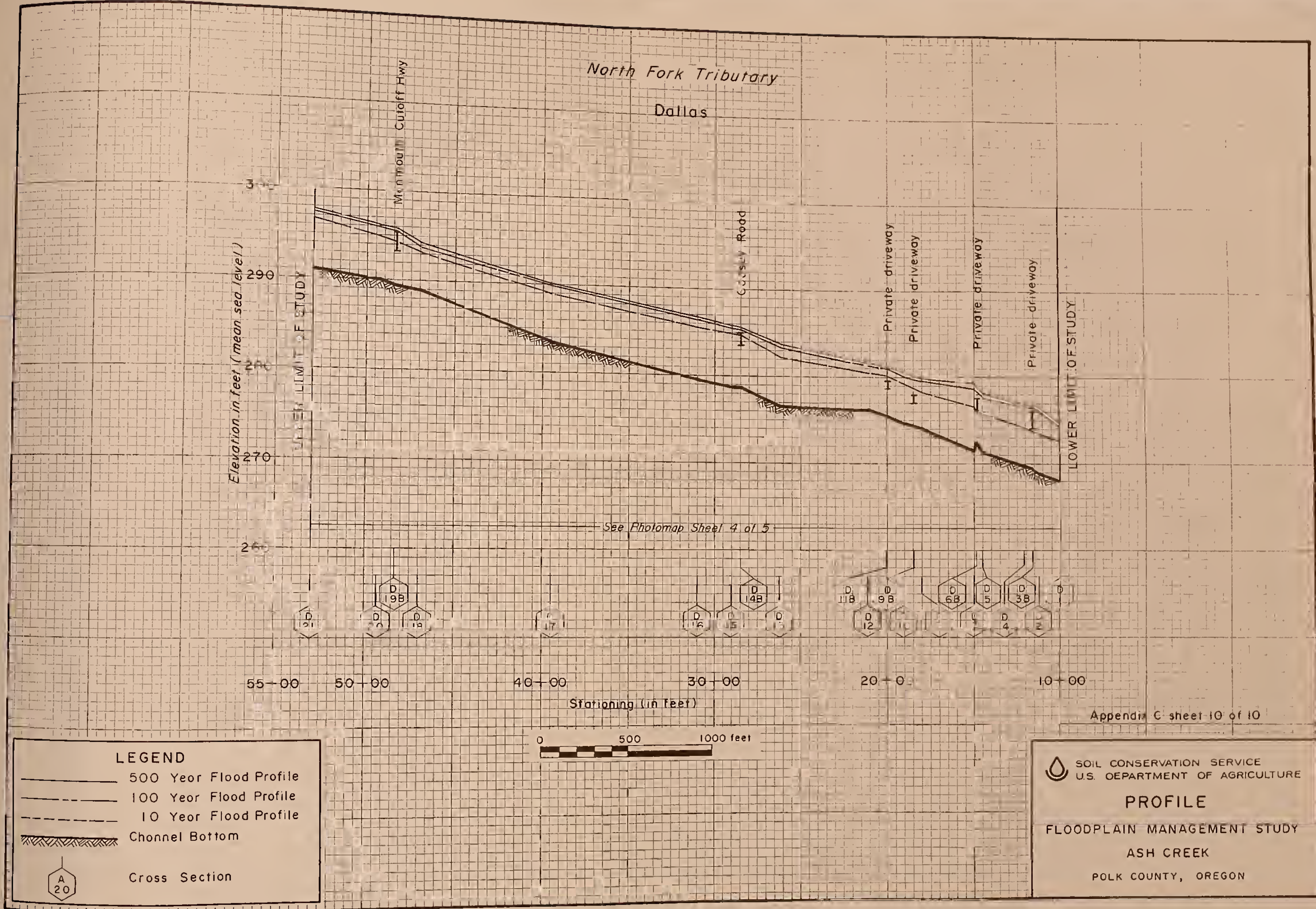
LEGEND

500 Year Fl
100 Year Fl
10 Year Fl
Channel Botto
Cross Sectio

SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE

PROFILE

FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON


North Fork Tributary
Dallas
Monmouth Cutoff Hwy
Godsey Road
Private driveway
Private driveway
Private driveway
Private driveway
UPPER LIMIT OF STUDY
LOWER LIMIT OF STUDY
Elevation in feet (mean sea level)
290
270
See Photomap Sheet 4 of 5
55+00
50+00
40+00
30+00
20+0
10+00
Stationing (in feet)
0
500
1000 feet
Appendix C sheet 10 of 10
LEGEND
500 Year Flood Profile
100 Year Flood Profile
10 Year Flood Profile
Channel Bottom
A 20
Cross Section
SOIL CONSERVATION SERVICE
U.S. DEPARTMENT OF AGRICULTURE
PROFILE
FLOODPLAIN MANAGEMENT STUDY
ASH CREEK
POLK COUNTY, OREGON

APPENDIX D
TABULATION OF CROSS SECTION DATA
AND FLOOD ELEVATIONS
ASH CREEK

Cross Section No.	Cross Section Station (Feet)	Channel Bottom Elevation (Feet)	Water Surface Elevations 10-yr (10%)	50-yr (2%)	100-yr (1%)	500-yr (0.2%)
		Sea Level Datum (SLD)				
ASH CREEK - Independence, Monmouth						
A-1	20+00	131.8	155.0	157.2	158.0	159.8
A-2B	20+50	131.9	155.4	157.8	158.7	160.5
A-3	22+10	131.8	155.4	157.8	158.8	160.5
A-4B	24+00	134.9	155.4	157.8	158.8	160.5
A-5	32+00	130.6	155.7	158.1	159.0	160.8
A-6	41+00	134.1	155.9	158.3	159.3	161.1
A-7B	41+70	134.0	156.0	158.5	159.6	161.6
A-8	42+20	134.1	156.0	158.5	159.6	161.6
A-9	51+90	133.4	156.5	159.0	160.0	162.1
A-10	61+60	134.4	157.0	159.4	160.5	162.5
A-11	64+40	141.0	157.1	159.6	160.7	162.7
A-12B	65+20	139.9	157.2	159.7	160.8	162.8
A-13	65+70	138.5	157.2	159.7	160.8	162.8
A-14	86+70	144.0	159.9	161.6	162.4	164.1
A-15	95+00	142.9	160.3	161.9	162.7	164.3
A-16	102+90	152.3	161.7	163.1	163.8	165.2
A-17B	103+40	150.7	162.1	163.5	164.1	165.5
A-18	106+10	150.6	162.4	163.6	164.5	165.5
A-19	115+00	152.8	163.3	164.4	165.2	166.0
A-20	126+60	154.1	166.0	167.0	167.6	168.4
A-21	142+95	157.7	170.5	171.7	172.2	173.2
A-22B	143+20	157.0	170.6	171.8	172.8	174.0
A-23	144+10	159.1	170.7	171.9	172.8	174.0
A-24	149+50	157.5	172.0	173.2	174.0	175.0
NORTH FORK - Monmouth						
A-25	151+40	160.4	172.4	173.6	174.3	175.3
A-26	162+70	163.7	173.9	174.9	175.3	176.0
A-27	177+00	166.5	176.7	177.4	177.6	178.1
A-28B	177+60	166.3	177.5	178.3	178.4	178.7
A-29	178+42	167.3	177.6	178.3	178.4	178.7

APPENDIX D
TABULATION OF CROSS SECTION DATA
AND FLOOD ELEVATIONS
ASH CREEK

Cross Section No.	Cross Section Station (Feet)	Channel Bottom Elevation (Feet)	Water Surface Elevations 10-yr (10%)	50-yr (2%)	100-yr (1%)	500-yr (0.2%)
		Sea Level Datum (SLD)				
SOUTH FORK - Independence						
S-1	65+20	141.1	157.1	154.6	160.6	162.7
S-2	74+00	146.1	157.8	160.2	161.2	163.2
S-3B	75+00	145.7	158.1	160.5	161.6	163.6
S-4	75+50	145.7	158.1	160.5	161.6	163.6
S-5	84+70	151.0	161.4	163.4	164.3	166.0
S-6B	85+50	151.9	162.1	164.0	165.0	166.6
S-7	86+00	151.0	162.1	164.1	165.1	166.7
MIDDLE FORK - Monmouth						
M-1	151+90	164.2	172.3	173.6	174.1	175.3
M-2	170+50	166.8	174.6	175.7	176.2	177.2
M-2A	177+30	167.7	175.7	176.6	177.0	177.8
M-3	182+00	169.0	177.2	177.7	178.0	178.6
M-4B	182+70	172.4	179.3	180.5	181.1	182.2
M-5	183+00	171.4	179.4	180.5	181.1	182.2
M-6	200+00	174.9	181.8	182.4	182.8	183.5
M-7	212+20	178.5	184.1	184.6	184.9	185.4
M-8	212+60	178.7	184.2	184.7	185.0	185.5
M-9	217+20	180.3	185.8	186.2	186.4	186.7
M-10B	217+80	180.3	187.5	188.0	188.2	188.4
M-11	220+50	181.2	187.5	188.1	188.2	188.5
M-20	227+00	184.4	187.7	188.2	188.3	188.6
M-21	237+50	185.6	189.2	189.4	189.5	189.7
TRIBUTARY TO MIDDLE FORK - Monmouth						
M-14C	180+70	174.2	178.7	180.3	181.3	183.5
M-15	182+00	174.6	178.7	180.3	181.3	183.5
M-16	186+20	174.9	178.9	180.4	181.3	183.5
NORTH FORK - Dallas						
N-10	500+00	261.6	266.5	266.8	267.2	268.1
N-11	512+28	269.3	272.4	272.7	272.9	273.5
N-12	522+40	275.5	279.7	280.0	280.5	280.7
N-13	529+80	279.6	283.6	283.8	284.2	284.5
N-14B	531+00	280.5	284.3	284.4	284.7	285.1

APPENDIX D
TABULATION OF CROSS SECTION DATA
AND FLOOD ELEVATIONS
ASH CREEK

Cross Section No.	Cross Section Station (Feet)	Channel Bottom Elevation (Feet)	Water Surface Elevations 10-yr (10%)	50-yr (2%)	100-yr (1%)	500-yr (0.2%)
		Sea Level Datum (SLD)				
NORTH FORK - Dallas (continued)						
N-15	532+44	280.2	284.9	285.1	285.5	286.2
N-16	546+87	286.7	290.4	290.7	291.0	291.6
N-17	554+75	289.2	293.4	293.8	294.1	294.8
N-18	560+72	292.8	296.7	297.0	297.4	298.0
N-19B	561+10	292.8	297.2	299.8	300.1	300.9
N-20	561+91	293.2	297.6	299.9	300.1	300.9
N-21B	562+80	293.7	298.3	300.7	301.0	301.5
N-22	563+88	294.2	298.6	300.8	301.1	301.6
N-23	565+37	294.8	299.4	301.0	301.3	301.9
N-24	570+51	297.7	302.0	302.5	302.8	303.4
N-25B	571+77	298.8	304.5	304.6	304.8	305.1
N-25A	572+07	298.7	304.5	304.7	304.8	305.1
N-26	573+62	299.0	304.6	304.8	305.0	305.3
NORTH FORK ABOVE MILL - Dallas						
N-32	585+50	313.8	314.0	315.0	315.1	315.4
N-33	591+45	308.4	315.5	316.3	316.6	317.1
N-34B	592+30	308.8	317.9	318.2	318.4	318.6
N-35	592+71	309.0	317.9	318.2	318.4	318.6
N-36	598+00	311.0	318.1	318.6	318.7	319.0
N-37	604+40	312.0	318.6	319.1	319.3	319.7
N-38	614+70	315.0	320.3	320.8	321.2	321.6
N-39	625+60	318.0	323.6	324.3	324.6	325.1
N-40	639+84	326.5	330.6	330.9	331.1	331.4
N-41	649+50	331.1	336.1	336.4	336.6	337.0
N-42B	650+48	330.2	336.6	337.3	337.5	337.8
N-43	651+10	332.0	336.6	337.3	337.5	337.8

APPENDIX D
TABULATION OF CROSS SECTION DATA
AND FLOOD ELEVATIONS
ASH CREEK

Cross Section No.	Cross Section Station (Feet)	Channel Bottom Elevation (Feet)	Water Surface Elevations 10-yr (10%)	50-yr (2%)	100-yr (1%)	500-yr (0.2%)
		Sea Level Datum (SLD)				
NORTH FORK TRIBUTARY - Dallas						
D-1	10+00	268.0	272.6	273.7	274.2	274.7
D-2	11+20	269.0	273.6	274.6	275.2	275.7
D-3B	11+60	269.4	273.9	276.2	276.5	276.8
D-4	12+00	269.8	274.2	276.3	276.6	276.8
D-5	14+50	271.1	275.8	277.1	277.5	277.8
D-6B	14+92	272.1	276.0	278.0	278.2	278.5
D-7	15+00	271.5	276.4	278.3	278.6	279.1
D-8	18+00	274.0	278.3	279.2	279.5	279.8
D-9B	18+35	274.2	278.8	279.4	279.7	280.0
D-10	19+00	274.7	279.2	279.7	280.0	280.2
D-11B	19+95	275.4	280.1	280.5	280.8	281.0
D-12	21+00	276.1	280.4	280.9	281.1	281.3
D-13	26+14	276.5	282.2	282.9	283.1	283.4
D-14B	27+44	278.8	284.8	285.0	285.1	285.3
D-15	29+00	278.8	284.9	285.1	285.3	285.5
D-16	31+00	279.8	285.3	285.9	286.3	286.4
D-17	39+40	283.3	288.9	289.5	289.8	290.0
D-18	47+10	289.0	293.2	293.4	293.6	293.9
D-19B	48+40	289.3	294.4	295.4	295.5	295.3
D-20	49+40	290.0	294.9	295.6	295.8	296.0
D21	53+00	291.0	296.6	297.0	297.3	297.4

APPENDIX E

INVESTIGATIONS AND ANALYSES

Field Surveys

Field surveys of the channel and valley were completed in the spring of 1984. Survey information was obtained by or with the assistance of each of the three City sponsors. Valley cross section data for Dallas was taken from existing 2-foot contour topographic maps of the city. Channel segments in Dallas and all section data in Independence and Monmouth were obtained by field survey methods.

There were 103 sections surveyed including 24 bridges. These sections include 24 on Ash Creek, 5 on North Fork Ash Creek in Monmouth, 7 on South Fork Ash Creek, 17 on Middle Branch, 29 on North Fork in Dallas, and 21 on the North Fork Tributary in Dallas.

High water marks from recent historic floods were located by interview with local residents and from available records. Data was obtained from the storms of December, 1964; January, 1972; December, 1980; and December, 1982. The high water elevations were used to check the computed elevations.

Hydrologic Analysis

Fourteen streamgages were investigated for use in a regional frequency analysis. Three of the gage records were dropped due to large drainage area or short gage record. The eleven streamgages used in developing the discharge vs. frequency relationship all drain areas between the crest of the Coast Range and the Willamette River. The gages used are listed in Table E-1.

Discharge vs. frequency relationship was developed for each gage using the Log-Pearson Type 3 statistical procedure, as described in Bulletin 17B Guidelines for Determining Flood Flow Frequency (Editorial correction March 1982) of the Interagency Advisory Committee on Water Data. Regression equations of peak discharge vs. drainage area were developed for several frequencies of storm using the discharge vs. frequency of the 11 gages.

The gages showed a high coefficient of determination (r^2) of approximately 0.90 for each frequency. The discharge vs. drainage area equation for the 100-year storm computed to be $q=142.0\ (A)^{1.08}$. The discharges used in the study are listed on Table E-2.

Hydraulic Analysis

Starting elevation for the mouth of Ash Creek was obtained from the U. S. Army Corps of Engineers. They had prior studies of the discharge vs. elevation of the Willamette River. The elevations used from the Willamette data were the same frequencies as the Ash Creek discharges. This considers that both the Willamette River and Ash Creek experience the peak flows at the same time, a conservative approach. However,

TABLE E-1

STREAMGAGE RECORDS

Gage No.	Name	Drainage	No.Yrs.
141741	Cox Cr. at Albany	15.2	16
141895	Luckiamute R. nr. Hoskins	34.3	45
141900	Luckiamute R. at Pedee	115.0	31
141901	Little Luckiamute R. nr Falls City	22.7	18
141907	Rickreall Cr. nr. Dallas	27.4	26
141908	Rickreall Cr. at Rickreall	46.7	19
141921	Glenn Cr. nr. Salem	2.72	25
141930	Willamina Cr. nr. Willamina	64.7	48
141933	Mill Cr. nr. Willamina	27.4	16
141943	N. Yamhill R. nr. Fairdale	9.03	16
141970	N. Yamhill R. at Pike	66.8	26

TABLE E-2

DISCHARGE FREQUENCY DATA

ASH CREEK

Cross Section No.		Discharge (cfs) by Frequency			
From	To	10-yr	50-yr	100-yr	500-yr
A-1	A-10	4,130	5,860	6,890	9,090
A-11	A-24	2,320	3,280	3,860	5,100
A-25	A-29	1,360	1,930	2,270	3,000
S-1	S-7	1,470	2,080	2,450	3,230
M-1	M-3	700	990	1,160	1,530
M-4B	M-11	620	880	1,040	1,370
M-20	M-21	240	340	400	530
M-14C	M-16	60	80	100	130
N-10	N-38	490	690	810	1,070
N-39	N-43	380	540	630	830
D-1	D-21	270*	440*	580*	770*

With overflow from North Fork included

it is very possible that both streams would experience a given frequency flood in the same storm although several hours or days apart. Some computations were developed using a low flood elevation for the Willamette River with the high floods on Ash Creek. These computations determined that there is no practical effect from the Willamette River at Gun Club Road with an increasing effect downstream to the river.

The starting elevations for the North Fork Ash Creek in Dallas were computed using normal depth procedures. Flow over the mill dam (N-32) was computed by weir flow relationships.

Water surface profiles were developed using SCS Technical Release No. 61, "WSP-2 Computer Program". This program uses the standard step method for running backwater curves and BPR "Hydraulics of Bridge Waterways" procedures for bridges. Field survey data was used in this program. Roughness coefficients (N-values) were determined by field observation and reflect the conditions in 1984. Many locations had very heavy brush and thick blackberry bushes, while some portions were newly constructed and cleaned out. Changes in the roughness condition, particularly permitting debris or brush to accumulate on clean banks, could change the flood elevations.

Velocity and elevation at each cross section for the 10, 50, 100, and 500 year flood events were determined from the WSP-2 program. Elevation vs. frequency data obtained through this study is listed in Appendix D. Depth of flow in the channel varies generally with drainage area. Channel flow depth in Ash Creek upstream of Gun Club Road averages about 13 feet. Other average flow depths are: South Fork - 14 feet, Middle Fork - 7 feet, North Fork - 5 feet, and North Fork Tributary - 6 feet. Channel velocities range from 1 to 7 feet per second (fps). Average velocity by stream segments are: Ash Creek below Gun Club Road - 3 fps, Ash Creek above Gun Club Road - 4 fps, South Fork - 3 fps, Middle Fork - 3 fps, North Fork below Mill - 5 fps, North Fork above Mill - 3 fps, and North Fork Tributary - 4 fps.

A portion of the flood flow between section A-24 and A-27 overflows into a separate channel and returns to the creek between A-18 and A-19. Separate water surface profiles were run for the two channels through this area and the discharges in Ash Creek were reduced accordingly.

The areas inundated by the 100- and 500-year flood were located on the aerial photo maps using the surveyed cross section data. The extent of flooding between sections was interpolated based on available topographic maps and field observation. Floodlines were not checked with field survey methods.

The WSP-2 program was used to evaluate the effect of many of the floodplain management alternatives considered in the study. This program was used to determine changes in hydraulics due to increased or reduced roughness, and enlargement of channel, culvert or cross sections.

Floodway

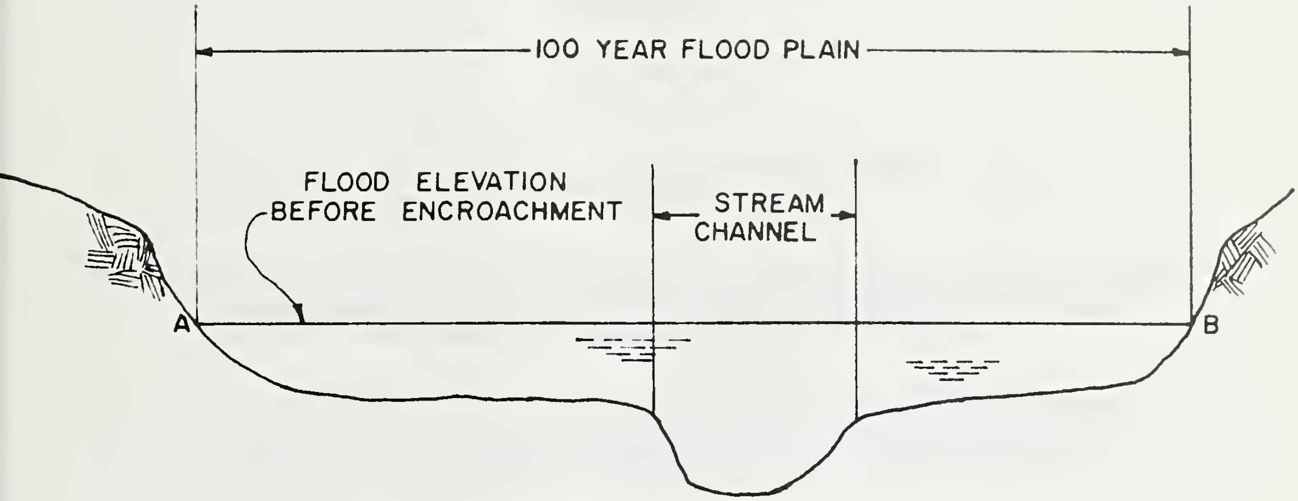
Encroachment on floodplains, by structures and/or filling, reduces the flood-carrying capacity and increases flood height, thus increasing flood hazards in areas upstream and downstream from the encroachment itself. One realistic aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard and potential damage.

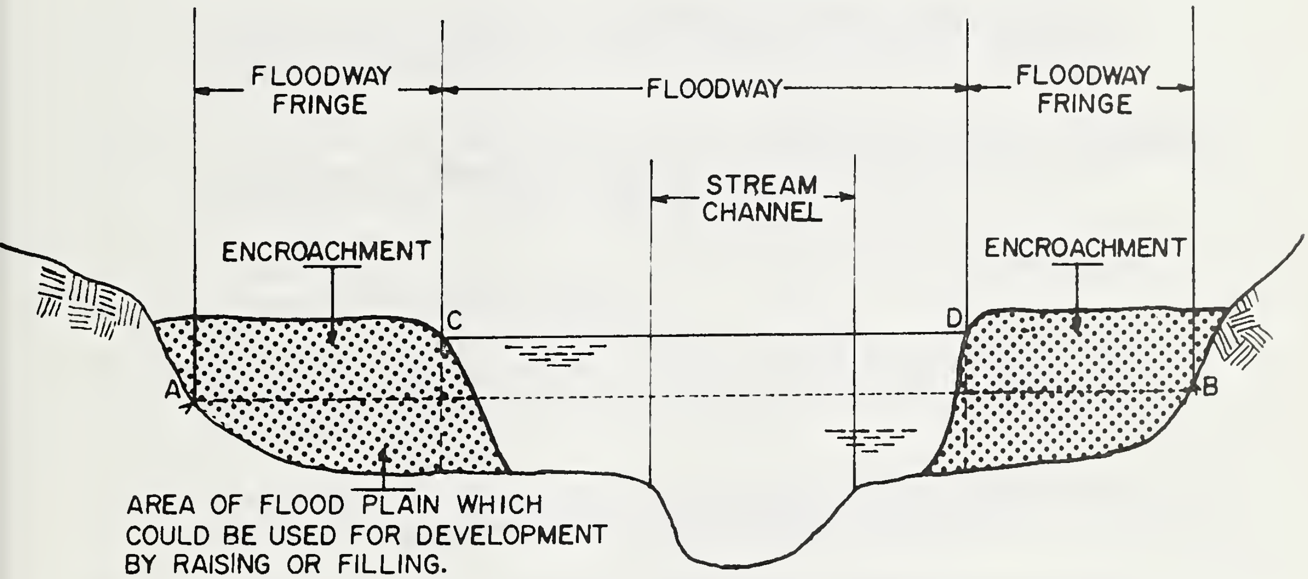
The concept of a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area inundated by the 100-year flood is divided into "floodway" and "floodway fringe areas". The floodway is the channel of a stream plus adjacent floodplain areas that must be kept free of encroachment in order that the 100-year flood be carried within a certain specified maximum difference in flood height. Regulations enacted by the Federal Emergency Management Agency (FEMA) limit such increases in flood heights to a maximum of one foot.

The area between the designated floodway and the boundary of the 100-year flood is called the "floodway fringe". No encroachment into the floodway should be allowed; however, building in the floodway fringe could be permitted if floor levels are at or above the 100-year flood elevation and there is no major increase (one foot or greater) in the water surface upstream. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown on Figure 1.

Diking is considered an encroachment on the floodplain, the same as filling. Building of dikes should be limited to the floodway. One of the management alternatives considered included a dike between A-24 and A-27 to eliminate the overland flooding described in the previous section. This proposal would raise the 100-year flood level just downstream by a little over the permissible one foot. This is because the flow is confined and there is also an increase in flow in this reach by the amount that by-passes those sections at present. Most of the area involved is confined by dikes for the sewage lagoons and the added height would not cause any problem to the lagoons.

In this report, floodways are proposed to the local governments as minimum standards that can be adopted (subject to FEMA approval) or that can be used as a basis for additional studies and refinement. A floodway was determined using SCS TR No. 64, "Floodway Determination Computer Program." This provided a floodway width and location on the cross-section of the stream. Location of the floodway between cross-sections was determined by field observation and map analysis.





LINE A-B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C-D IS THE FLOOD ELEVATION AFTER ENCROACHMENT

FLOODWAY RELATIONSHIPS

FIGURE 1

APPENDIX F

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APPENDIX G

GLOSSARY OF TERMS

Acquisition	Purchasing flood-prone properties for the specific purpose of reducing flood damage by changing land use.
Critical Area Treatment	The application of vegetative and mechanical practices used to reduce runoff and erosion. Practices normally consist of seeding, tree planting, grass waterways, diversions, gully stabilitzations, etc.
Environmental Corridor	A strip of land, usually along one or both sides of a stream, which is set aside, regulated, or otherwise protected to preserve its environmental values.
Flood	An overflow or inundation that comes from a river or other body of water and causes or threatens damage.
Flood Crest	The maximum height of the water surface during a flood. This may or may not be the maximum discharge (cfs).
Flood Frequency	An expression of how often a hydrologic event of given size or magnitude should, on an average, be equaled or exceeded.
100-Year Flood	100-year flood is the size of flood which will be equaled or exceeded, on the average, of once in 100 years or a one-percent chance in any one year.
500-Year Flood	A flood which will be equaled or exceeded, on the average, once in 500 years. It is included to indicate an extreme flood.
Flood Hazard	The risk to life or damage to property from overflows of the river or stream channel; flood flow in intermittent or normally dry streams; floods on tributary streams; floods caused by accumulated debris or ice in rivers; or other similar events.
Floodplain	The area adjoining a river, stream, watercourse, ocean, bay or lake, which has been inundated by a flood or can be reasonably expected to be inundated in the future.

Floodproofing	A combination of structural provisions, changes, or adjustments to properties and structures subject to flooding primarily for the reduction or elimination of flood damages to properties, water and sanitary facilities, structures, and contents of buildings in a flood hazard area.
Hydrologic Soil Group	Hydrologic Soil Groups are used to estimate the runoff amount from a rainfall. There are four soil groups: A, B, C, and D. The A group has the lowest runoff potential and the D group has the highest runoff potential.
Percent Chance Flood	See Flood Frequency.
Prime Farmland	Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, and fiber, and also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.
Relocation	Moving a building from a flood-prone area by physically placing it on a vehicle and transporting it from the floodplain.
Return Interval	An alternate term to express flood frequency.
Sea Level Datum (SLD)	The full title is the "Sea Level Datum of 1929 Through the Pacific Northwest Supplementary Adjustment of 1974." A standard adopted for measuring elevations, which is based upon the average height of the sea for all stages of the tide over a 19-year period.
Water Surface Profile	A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elvation for the crest of a specified flood, but may be prepared for conditions at a given time or stage.
Wetland	An area where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities present; generally includes swamps, marshes, bogs, shallow lakes, and similar areas.

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